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Training potential witnesses to produce higher quality face composites

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Training Potential Witnesses to Produce Higher

Quality Face Composites

D. Bradley Marwitz

in Candidacy

for the degree of Master of Arts

in Psychology

1989

Dr. Michael S. Wogalter

This study attempted to determine if training and familiarization with a composite construction system would improve the quality of subjects' composite production. Subjects were trained in the use of the Mac-a-Mug Pro system over two sessions. During the course of the two meetings, subjects constructed eleven composites (six from memory and five with the face in-view) and were allowed time to practice with the system. Results suggests that the quality of subjects' composites improved with practice. However, training with the composite system prior to exposure to the first face did not lead to higher quality composites. These results have implications for the training of personnel at high risk of witnessing a crime.

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Training Potential Witnesses to Produce Higher Quality Face Composites

By

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Following a crime witnesses are often asked to aid the police investigation by constructing a composite likeness of the suspect. Research in the area of composite production has shown that current composite construction techniques such as the sketch artist, the Identikit, the Photofit, and the Field Identification System do not produce good likenesses of the target face (Davies, Ellis, & Shepherd, 1978; Ellis, Shepherd, & Davies, 1975; Ellis, Davies, & Shepherd, 1978; Laughery & Fowler, 1980; Wogalter, Laughery, & Thompson, 1988). The failure of current composite systems to produce good likenesses would seem to warrant investigation of methods to improve the construction process in order to be more useful to law enforcement personnel. While there have been many studies dealing with the recognition of faces and a few dealing with the recall of faces, there has been no known research concerning composite construction training. The present research sought to determine whether training and familiarization with composite systems (such as the Mac-A-Mug Pro system) would enable potential witnesses to construct more accurate and helpful composite pictures.

Variables that Affect Face Recognition

Composite construction is a forensic procedure that involves both the recall and recognition of a face, and is usually differentiated from pure recognition procedures such as the mugfile or lineup search. Most of what is known about face memory comes from recognition studies; there have been very few studies dealing with face recall. In order to provide a more complete history of relevant topics, research in the area of recognition will be presented before the issue of recall is addressed.

Levels of Processing Theory. One theory of facial memory that has received recent attention is the depth of processing theory (Craik & Lockhart, 1972). This theory suggests that the "deeper" the processing of a stimulus, the better the memory of that stimulus will be. Stimuli processed in terms of sensory (shallow) features will be remembered less well than stimuli processed in terms of semantic (deep) features. The depth of processing model was first explained with regard to verbal learning but has been expanded by several researchers in an attempt to include facial memory.

Bower and Karlin (1974) report evidence from a series of studies that supports the depth of processing model for facial stimuli. Subjects were shown a series of photographs and were required to make one of several types of judgments about the person in the photograph. In the shallow encoding condition subjects were to judge whether the person in the photograph was a male or a female. In the deep encoding conditions subjects were asked to judge how intelligent, honest, or likeable they thought the person in the photograph was. Lower recognition performance was found for the shallow encoding condition than for the deep encoding condition on a subsequent recognition task. Though the results can be used to support the depth of processing position, a different interpretation is also supported. The task of the subjects in the shallow encoding condition (judgment of gender) could have been accomplished through a glance at the photo. Conversely, judgments of intelligence, honesty, or likeability may require greater viewing time to process the photograph. Therefore, the obtained results may only be indicative of processing time and not actual depth of processing. Strnad and Mueller (1977) found a similar pattern of results using a between-subjects design. However, even with the procedural change, the possibility that the findings result from more and not deeper processing cannot be dismissed.

<u>Feature and Holistic Analysis in Terms of Levels of Processing</u>.

Drawing on the levels of processing findings, numerous studies have explored whether a feature analysis or a holistic analysis of a facial stimulus would lead to better recognition. This line of thinking assumes that a feature analysis is a form of surface processing while a holistic analysis is processed more deeply. However, Penry (1971) suggests that the best way to remember a face is to analyze the individual features of the face and to categorize these features on the basis of a series of exemplars for each feature; a method that would seem to be contradictory to the depth of processing model. Along this line, Woodhead, Baddeley, and Simmonds (1979) attempted to improve facial memory through the participation in a training session which focused on the analysis of individual features of the face. The training session consisted of three days of intensive instruction using lectures, slides, films, and applied practice. The researchers found that performance of the subjects who received training was never significantly better than those who received no training and in one condition was worse. Woodhead et al., suggest that the failure of the program was due to the emphasis placed on individual features and that this may not be the most advantageous method of processing facial stimuli. Hence, this study fails to support Penry's ideas of feature based analysis but the authors suggest that the results do support the depth of processing model.

In an attempt to show that a more holistic approach to processing facial stimuli might be more effective, Winograd (1976) had subjects participate in nine tasks concerning facial stimuli. Three tasks concerned physical characteristics (hair, nose, heaviness), three concerned traits of face in the photo (intelligence, anxiety, friendliness), and three concerned the occupational role of the person in the photo (actor, teacher, businessman). Winograd hypothesized that questions dealing with physical features would lead to poorer recognition than those dealing with traits or roles. This reasoning was based on the premise that an analysis of physical features would be a sensory or shallow encoding scheme. The results partially supported this hypothesis. When attention was called to one particular feature (hair, nose), recognition was poorer than for the other tasks. However, when attention was called to the heaviness of the face, a physical feature that might involve more examination or viewing time, recognition was no poorer than for the trait or role tasks. Winograd attempts to explain this finding relative to the amount of processing necessary to make a judgment of heaviness. He suggests that this assessment requires a more global or holistic processing of the face, and the more global the assessment the more features there are that are encoded. According to Winograd, encoding more features will lead to increased recognition. He also suggests that any level of processing that is deeper than simply viewing the face as a stimulus will increase later recognition.

Patterson and Baddeley (1977) also examined the relative merits of a feature analysis versus a trait analysis by having subjects either make a series of judgments about the personality of the face or simply process the physical features of the face. These judgments, even those concerning the physical features, required the subjects to analyze the whole face. This assured that the effects were due to a deeper level of processing and not simply due to more things being processed, a problem that plagued the methodology of Bower and Karlin (1974) and Strnad and Mueller (1977). Patterson and Baddeley found that subjects who encoded the personality characteristics of faces showed slightly better recognition than subjects who used individual features as a method of encoding.

The results of studies such as those discussed above seem to support the idea of a levels of processing model of face memory even though the effects are often small (Patterson & Baddeley, 1977). However, in a review of the literature, Winograd (1978) suggests that the crucial factor in improving face memory (in this case, recognition) is to have the subject to process the face as a whole and not as a set of individual features. Thus, he suggests that wholeness not depth is the important factor for facilitating recognition performance. This would seem to suggest that the depth of processing model is insufficient to account for memory differences. Craik and Tulving (1975) offered an extension of the levels of processing theory that attempted to correct for this inconsistency. Craik and Tulving attempted to incorporate breadth as well as depth into the levels of processing concept. They presented evidence suggesting that at any depth, the more broad and elaborate the encoding, the greater the probability that an item will be remembered. Craik and Tulving work used verbal material to show that the association between two words is more effectively remembered if words are grouped into a single detailed episode.

Baddeley and Woodhead (1982) extended these findings to include facial memory. Subjects were presented with faces accompanied by a description of the personality and background of the person whose face was presented. In the second of three studies, Baddeley and Woodhead presented faces accompanied by either an elaborate personality description and history (experimental group), a minimal personality description and history (control group), or an equivalent amount of irrelevant information The face was presented on the first page of the test booklet. The description was presented on the second page and the face was presented again on the third. Assuming that this presentation of information would extend breadth for a given depth, one would predict that subjects would better recognize the face associated with the elaborate description. However, there was no significant difference in facial recognition between the three conditions. Thus, the results of the Baddeley and Woodhead experiment suggest that adding elaborate verbal information (extending the breadth of processing for a given depth) does not improve one's ability to recognize faces. These results suggest that the theory put forth by Craik and Tulving (1975) using verbal stimuli may not be generalizable to facial stimuli.

Encoding Specificity: Improving Recognition and Recall. Although the depth of processing model has received some support in that holistic analysis seems to facilitate recognition more than a feature encoding analysis, it is unable to account for all effects. In an attempt to examine these effects further, one may point to the principle of encoding specificity which predicts that the memorial operation at test (performance) is influenced by the encoding operation used at study. Wells and Hryciw (1984) showed a crossover interaction of encoding and retrieval operations: They demonstrated a recognition facilitation through the use of trait-encoding operations and a recall (composite construction) facilitation through the use of feature encoding. That is, a face was best identified under trait-encoding conditions and best reconstructed under feature-encoding conditions. Thus, the utility of feature encoding depends on the kind of memory assessment technique to be used. When there is no suspect available, either live or in a mugfile, the only method available to police is recall construction, and the use of feature encoding should be beneficial to composite quality.

Training in Face Memory

Recognition. As mentioned earlier Woodhead et al., (1979) found that training had no positive effect on the ability to remember faces and in one case was detrimental. They attributed this failure to produce recognition improvement to the fact that the training focused on the study of individual features. This explanation is in agreement with the theory of encoding specificity and the results obtained by Wells and Hryciw (1984). That is, recognition (which generally tests global familiarity) is facilitated only when the encoding process involves more global aspects of the face. Further, encoding specificity would predict that if Woodhead et al., (1979) had used a method of testing memory that involved the selection of individual features (like composite construction) they might have found improved performance due to training.

Despite the failure of Woodhead et al., (1979) in finding any positive effects of training, other studies have been able to show an improvement in facial recognition. These studies have generally been directed at erasing the deficit that often exists for faces of another race. Elliott, Willis, and Goldstein (1973) investigated the effects of paired associate discrimination training on the memory for either white or Oriental faces. Their subjects were whites and the goal was to improve the memory for other race faces (in this case, Oriental faces). The results indicate that white subjects were originally superior on their recognition of white faces compared to Oriental faces. Training with Oriental faces improved their ability to remember other Oriental faces but no effect of training was shown for recognition of white faces. Other studies have also demonstrated the ability to erase the other race deficit (Malpass, Lavigueur, & Weldon, 1973; Lavrakas, Buri, & Mayzner, 1976). Thus, training appears to facilitate the recognition of faces of other races.

Interestingly, there have been no studies that successfully produced an improvement in memory for own race faces. Malpass (1981) suggests that this may be due to two factors: 1) face recognition performance is overlearned to the point that further training would have no effect, and 2) the methods used in this type of training are unnatural and counteract one's own natural memorial strategies. Malpass further suggests that much effort needs to be put into the study of facial recognition training so that the mechanisms behind it may be understood.

Recall. Although there has been abundant research dealing with recognition, its underlying processes, and how to improve it, very little work has been done on recall. Because recall appears to be a more difficult and complex task, one would expect that an act of recall such as producing a composite likeness would have severe limitations. The literature does support the idea that composite production is much less than perfect and these studies will be discussed following a description of various production techniques.

Composite Production Techniques

Composite production refers to the process of having a witness help to generate a pictorial likeness of a suspect. This can be done by having the witness describe the suspect verbally with a sketch artist and having the sketch artist produce a picture based on this description. The artist and the witness interact and revise the drawing until the witness is satisfied with the likeness. Other methods of generating composite pictures include the use of construction systems such as the Photofit system, the Identi-kit system, the Field Identication System (FIS), and the Mac-A-Mug Pro.

Identi-kit. The Identi-kit is a group of transparent sheets containing drawings of numerous varieties of the following facial features: chin, eyes, eyebrows, hair, lips, and nose. The recommended method of use is to have the witness describe the suspect based on the Identi-kit operator's cues. The operator then constructs an original likeness using the system of transparent overlays. As with the sketch artist, the operator and the witness work together and may revise the composite until the witness is satisfied. The Identi-kit also contains drawings of accessories such as wrinkles, glasses, moustaches, and scars in order to give the composite a more life-like appearance.

Photofit. The Photofit system of composite production was developed by Jacques Penry and also has a coded range of basic features: eyes, nose, mouth, chin, and forehead/hair (Penry, 1970). However, the features are individually printed on a thin card which may then be assembled into a special frame, thereby building the composite in a jig-saw fashion. Most operators of the Photofit system use it just as the Identi-kit is used; obtaining a cued initial description, generating an initial likeness, and then revising it until satisfied. The Photofit system also has the capacity for adding accessories such as beards, hats, moustaches, and glasses. In addition to these accessories, the likeness may be further enhanced by the use of black and white wax pencils. An advantage of the Photofit is that it has the capacity to utilize more easily the witness' visual recognition rather than depend solely on verbal recall. This is facilitated by the 'Visual Index' which is a collection of miniature pictures that portray all of features contained in the kit for easy reference and consultation.

Field Identification System. The Field Identification System (FIS) is different from the sketch artist, the Photofit system, and the Identi-kit system in that the witness can generate the composite without the help of another person. The FIS is a book-like device that contains a series of horizontal page strips. The top set of strips contains numerous varieties of hair styles. The next set of strips contains varieties of eyes and eybrows, while the third set of strips portrays varieties of noses and ears. The bottom set of strips contain the mouth and chin varieties. The witness can search through the book and piece together the appropriate strips to produce a composite likeness. The advantages of this system are that it is inexpensive, easy to use, and does not require the interaction of the witness with another person.

Mac-A-Mug Pro. The Mac-A-Mug Pro construction system is a computer assisted program that contains digitized exemplars of the different facial features. An instruction manual that contains replicas of the included exemplars allows the user to browse through the entire set of features. The user then can select a desired feature and have it brought up onto the screen. This can be repeated until the composite is completed.

Accuracy of Composite Techniques

As mentioned earlier, the production of composite likenesses has not been shown to be very accurate. Ellis et al., (1975; 1978) ran a series of studies examining the accuracy of composites generated using the Photofit system. They found that the composites were rated as being poor likenesses when judged by independent judges and would be of limited use to law enforcement agencies. Specifically, they found that longer exposure to the face, having the face present during construction, and the use of an experienced operator did not significantly affect the quality of the composite likeness. Ellis and his colleagues suggest that the failure of the subjects to produce accurate composites is due to a lack of precision in the system itself.

Similarly, Laughery and Fowler (1980) examined the accuracy of the sketch artist and Identi-kit systems using goodness-of-fit ratings comparing the composite and the actual photograph. The composites generated using the Identi-kit were rated as being quite poor; the sketches were rated as better, but were poor nonetheless. In a earlier study, Laughery and Smith (1978) had found that sketches were more helpful than Identi-kit composites when attempting to identify the person upon whom the likeness was based.

The main problem with the sketch artist and Identi-kit systems are that they require the interaction of the witness with another person (either artist or Identi-kit operator) to produce a representation of the face. This interaction leads to increased cost as well as problems with communication between the two. The Field Identification System (FIS) is a system for generating composites that was designed to be less costly as well as not requiring the presence of a second person. Laughery, Smith, and Yount (1980) explored the accuracy of the FIS following procedures identical to those used by Laughery and Smith (1978) except using FIS composites instead of Identi-kit and sketch artist composites. They found, when comparing their results with those of Laughery and Smith, that recognition performance was best with sketches, next best with Identi-kit composites, and poorest with FIS composites. The experimenters suggest that in the sketch and Identi-kit systems the presence of the expert, who is familiar with the procedures, helps lead to improved composites. The subjects who used the FIS were using it for the first time and it is probable that they were just not very good at it. Another possible explanation is that with the sketch artist there is an infinite range of feature varieties to choose from, while the other systems are somewhat more limited in in the number of feature exemplars that are available. In a related study, Wogalter, Laughery, and Thompson (1988) found that increased exposure time did lead to higher quality composites using the Mac-a-Mug Pro system.

The present study sought to improve the quality of composite productions by familiarizing subjects with the composite system to be used. For the purposes of the present study, subjects were trained in the operations of the Mac-A-Mug Pro composite system. This system combines the ease of the FIS, a lot of the range of the sketch artist, and the presence of the expert for the Photofit and Identi-kit systems. By becoming familiar with the system in an initial training session and then by practicing with the system, it was expected that composite production would improve as subjects continue to generate composite likenesses. In a sense, the subject becomes his/her own expert operator.

Significant results might have implications for employees that are in high crime risk jobs (e.g., bank tellers, security guards, and convenience store clerks). In this situation the employee could undergo an initial training session and have periodic practice sessions to maintain a level of efficiency. If called upon to generate a composite, the witnesses might be able to generate a more accurate likeness of the suspect than those witnesses who had not been trained; and thus, increase the probability of obtaining an accurate and helpful composite likeness.

Method

Design

The design of the study was to identify composite quality improvement across six faces. This face order variable was a within-subjects factor.. Additionally, a comparison was made between the first composite of each of three groups of subjects. An Instructions-First group received their initial training before exposure to the first target face. A Face-First group was exposed to the target face before receiving training. Both of these groups performed a recognition task after completing the first composite. It was expected that the quality of initial composite likeness would be higher for the Instructions-First group. The Recognition-First group saw the face first and then performed a non-spatial distractor task for fifteen minutes. Following the distractor task, subjects in the Recognition-First group performed a recognition task and then generated the composite likeness. The purpose of the Recognition-First group was to compare recognition performance with the other two groups in an attempt to determine the effect of composite construction on subsequent recognition. The issues involved for the inclusion of this group were not of direct relevance to the present thesis. For this reason performance of this group is discussed only briefly.

Subjects

Undergraduate students at the University of Richmond participated in the study. There were fifty-four subjects (30 women, 24 men) who were randomly assigned to one of the three groups (eighteen per group). Subjects in the Face-First and Instructions-First groups participated in the training portion of the study and received three hours of research participation credit. Subjects in the Recognition-First group only generated one composite and completed the recognition task. These subjects performed distractor tasks and other filler activities to insure that they were also eligible to receive three hours of research participation credit. The purpose in giving these subjects three hours of credit was to eliminate any motivational variable that might cause subjects to self-select into certain groups. Later, a separate group of ten Rice University graduate students judged the accuracy of the composites when compared to the target photograph using one of two tasks (five judges per task). Their performance was used to formulate composite quality scores.

Apparatus and Materials

The target photographs were taken from college yearbooks and made into slides that were projected onto a white surface with the use of a slide projector. The target slides consisted of faces of six white males. Order of presentation of faces was counterbalanced across subjects using a Latin square design. In addition to the target faces, distractor slides used in the recognition task were presented in the same fashion.

The composites were generated using the Mac-A-Mug Pro software described earlier. This software was run on an Apple Macintosh computer with a hard disk drive. The Mac-A-Mug Pro system allows the user to select and place the different features through the use of a mouse pointer, pull-down command windows, and various keyboard commands. This program is easy to use and is accompanied by a manual that contains helpful instructions as well as replicas of the feature varieties that the program can access. Use of this system requires initial training with the computer to be used as well as familiarization with the software itself. However, the users are quickly able to use the system to generate and revise composites.

<u>Procedure</u>

<u>Composite training and recognition task</u>. Subjects were randomly

assigned to one of three conditions and worked individually. Subjects assigned to the Instructions-First condition first received instructions and a demonstration of the use of the computer and software. They were instructed in the use of the instruction manual to locate features and the mouse pointer to place these features on the screen. The editing tools of the system were also explained thoroughly to them. Finally, the experimenter constructed a sample face as a demonstration for the subjects. These subjects were then allowed ten minutes to experiment with the system and become familiar with the controls and operations. After this initiation process the subjects were told that they would be exposed to a target face and be asked to construct a composite likeness of that face. The target face was projected for a total of eight seconds and then removed. The subject then had 20 minutes to construct the composite, which was saved and labeled (with a code that indicated subject number, face number, face position, and memory or in-view).

After the construction of the composite, the experimenter allowed the subjects to ask questions about the software or the construction process. Next, the subjects were given a recognition task in which they were shown a series of 80 slides of white male faces. The face that the subjects based their first composite likeness on appeared in position 76. Subjects were asked to give each face a rating from 1 to 6 to indicate having seen the face before or not. Ratings of "1", "2", or "3" suggested that the subject had not seen the face before (a "No" response), with "1" indicating certainty, "2" indicating probably, and "3" indicating possibly. Ratings of "4", "5", or "6" indicated that the subject had seen the face before (a "Yes" response) with "4" being possibly, "5" being probably, and "6" being certainty.

Following the completion of the recognition task, subjects were shown another target face for eight seconds and given 20 minutes to generate a composite likeness of this face. This composite was saved and labeled. At this point the subject was allowed to work on a copy of the composite with the target face brought back into view which was also saved. Following this touch-up period, which served as additional training, the subject was exposed to a third target face for eight seconds and given another 20 minutes to generate a composite likeness that was saved. The subject was again allowed to touch-up a copy of the composite with the target face in view. Subjects were then dismissed from the first session with the instructions that the second session would consist of more composite constructions.

At the second session subjects were asked if they had any questions about the procedure or software (none of the subjects asked questions). They were then exposed to a target face for eight seconds and given 20 minutes to generate a composite likeness to be saved. Once again, the subjects were allowed to work with a copy of the composite likeness with the target face in view. Subjects saw a total of three target faces during the second session, being allowed to touch-up a copy of the composite after the original likeness was saved. This yielded a total of six composite likenesses generated from memory and five composites done with the target face in-view for each subject. Subjects were then debriefed and dismissed. As discussed earlier, the order of presentation was counterbalanced across subjects. That is, each face appeared in all positions an equal number of times.

The schedule of the initial meeting for subjects in the Face-First was similar to that of the Instructions-First condition, with one exception. Subjects in the Face-First condition were told that they would be exposed to a target face and would be asked to construct a composite likeness of this face. However, the target exposure preceded the instruction and demonstration of the computer and software. This sequence is analogous to the order in which actual witnesses would currently experience these activities. The witness would be exposed to a suspect and would then have to become familiar with a composite production system in order to generate a composite likeness of that suspect.

After exposure to the target face, subjects in the Face-First condition received the same demonstration and instructions that subjects in the Instructions-First condition received and also were allowed the same period to experiment with the system. Following this initiation process the subjects were instructed to generate a composite likeness of the target face. Once the subjects began the first composite construction, the rest of the procedure (including the second meeting) was identical to that of the Instructions-First condition.

Subjects in Recognition-First condition initially received no training with the composite production system. They were exposed to the target face and then engaged in a 20 minute distractor task dealing with another psychological study. In this distractor period subjects performed a non-spatial sorting task with a list of behaviors. At the end of this distractor task, subjects then participated in the same recognition task as subjects in the other two conditions. Following this the subjects were given the demonstration and instructions with the composite system and were asked to generate a composite likeness of the target face. This tested the effect of a recognition task on subsequent composite quality. The Recognition-First group also returned for a second meeting that consisted of other, unrelated research projects conducted by other members of the Psychology Department.

Evaluation of composite quality. A group of Rice University graduate students were used to evaluate the quality of the composite likenesses. There were six composites from memory and five in-view composites for each subject in the Face-First and Instructions-First groups; and there was one composite for each subject in the Recognition-First group. This yielded a total of 414 composites. There were five judges who performed a matching task and five who performed a similarity rating task. Judges in the matching task were presented with a display of all six target faces that were converted to photographs (two rows with three faces per row). The judges examined each composite (including those that were constructed with the target face in view) and chose the target face that they thought was the basis for each likeness. The judges worked independently and examined only one composite at a time, trying to choose the correct corresponding target face for each composite.

Judges performing the similarity rating task were given each target face and all of the composites that were generated from that target. The composites for each target face were randomly arranged into a booklet. The task of the judges was to compare each composite to its corresponding target face and rate the "goodness of fit" of each of the composites on a six point scale, with a rating of "0" meaning not at all similar and a rating of "5" indicating extremely similar.

Results

The data were composite quality measures derived from the similarity ratings and the matching scores. These were produced by subject-judges using the composites generated by the experimental subjects. For each composite the matching scores were averaged across the five judges; thus providing a mean matching score for each composite. The same procedure was followed to yield a mean rating score for each composite. The means for each composite were then used to derive mean matching and rating scores for each face position (i.e., first through sixth). Cell means for the entire design are found in Table 1.

Table 1

Overall Cell Means for the Experimental Design

Face	1st	2nd	3rd	4th	5th	6th
Instructions-First Group						
Memory	.2890	.3889	.4000	.3778	.4444	.4556
MATCHING						
In-View	X	.5222	.4222	.4556	.4667	.4222
Memory	1.5220	1.5556	2.0000	1.7889	1.7778	1.9889
RATING						
In-View	X	1.7889	1.9889	2.0667	2.1111	2.4111
Face-First Group						
Memory	.3220	.3333	.4111	.3778	.4444	.3333
MATCHING						
In-View	X	.4889	.4111	.3556	.3444	.5333
Memory	1.5330	1.5778	1.6778	1.7889	1.8000	2.0333
RATING						
In-View	X	1.8111	1.7667	2.0556	2.0667	2.4222
Recognition-First Group						
Memory	.3780	X	X	X	X	X
MATCHING						
In-View	X	X	X	X	X	X
Memory	1.4560	X	X	X	X	X
RATING						
In-View	X	X	X	X	X	X

Several analyses of variance (ANOVAs) designs were required to analyze the data due to the incomplete balancing of conditions in the experiment. The reason for this is that there was no In-View condition for the first face. This necessitated using smaller ANOVAs in order to analyze all cells in the experiment. The factors involved in these analyses are group (Face-First, Instructions-First, Recognition-First), judgment task (matching, rating), face order (first through sixth faces), and face presence (Memory, In-View).

ANOVA by Group. The first analysis conducted was a one factor analysis of variance (ANOVA) performed on the mean matching scores of the first face (which had only a memory condition) across the three groups. This analysis failed to show any significant differences among the three groups for this first face ($F < 1.0$). The same analysis performed on the mean rating scores for the first face of the three groups also failed to find any significant differences among the groups ($F < 1.0$). Because group membership had no effect on this first face (and this was the only place that it was expected), the scores for the Face-First and Instructions-First group can be collapsed and are found in Table 2. However, the remaining analyses continued to include the group factor to

Table 2

Overall Cell Means for the Experimental Design Collapsing Across Face-First and Instructions First-Groups

		Face Order				
	1st	2nd	3rd	4th	5th	6th
Memory	.3055	.3611	.4056	.3778	.4444	.3944
MATCHING						
In-View	X	.5056	.4167	.4056	.4056	.4778
Memory	1.5275	1.5667	1.8389	1.7889	1.7889	2.0111
RATING						
In-View	X	1.8000	1.8778	2.0611	2.0889	2.4167

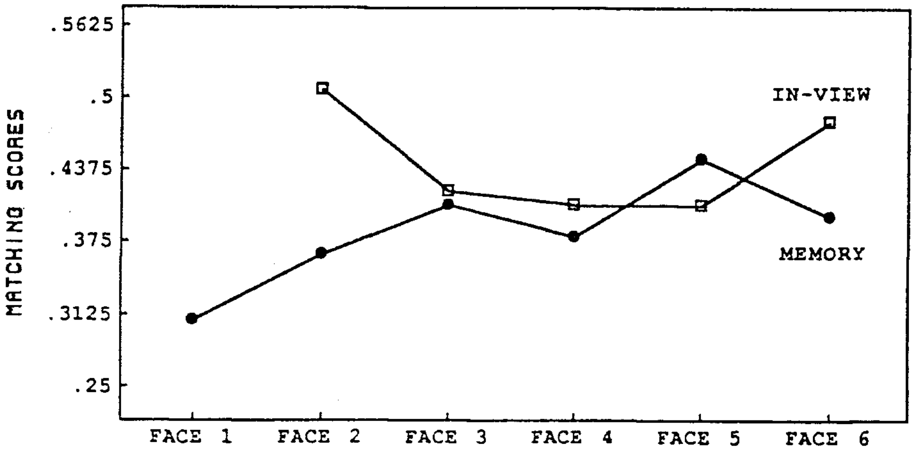
insure that it did not interact with any of the other factors.

ANOVA by Face Order. The next analysis conducted was a 2 X 6 mixed- model ANOVA. The factors involved in this analysis were group (Face-First, Instructions-First) and face order (first through sixth faces). Because the first face had no in-view condition, only the composites generated from memory were analyzed in this ANOVA. Main effects analysis of the mean matching scores failed to reveal any significant difference between the Face-First group and the Instructions-First group, ($F < 1.0$). There was also no significant main effect for face order, ($F < 1.0$). Mean scores for the six faces collapsed across groups appear in Table 2. There was also no significant interaction of group and face order ($F < 1.0$). Figures 1 and 2 provide summaries of the effects of the factors involved in the analyses.

This same ANOVA design using the mean rating scores also failed to find either a significant effect of group or a significant group by face order interaction, (F's< 1.0). However, there was a significant main effect found for face order, $F\ (5,170) = 2.49$, $p < .05$. Figure 3 shows that both of the groups reveal a general increase in similarity ratings from the first to the sixth faces. As can be seen in Table 3, pairwise

Figure 1

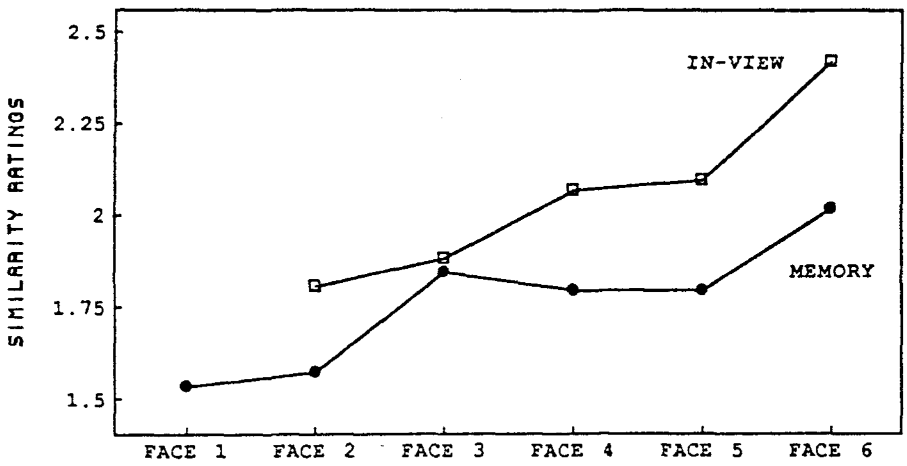
Matching scores for in-view versus memory faces, collapsed across the Face-First and Recognition-First groups.



Note: There was no in-view condition for the first face.

Figure 2

Rating scores for in-view versus memory faces, collapsed across the Face-First and Recognition-First groups.



Note: There was no in-view condition for the first face.

Figure 3

Rating scores for the Face-First and Recognition-First groups on faces done from memory.

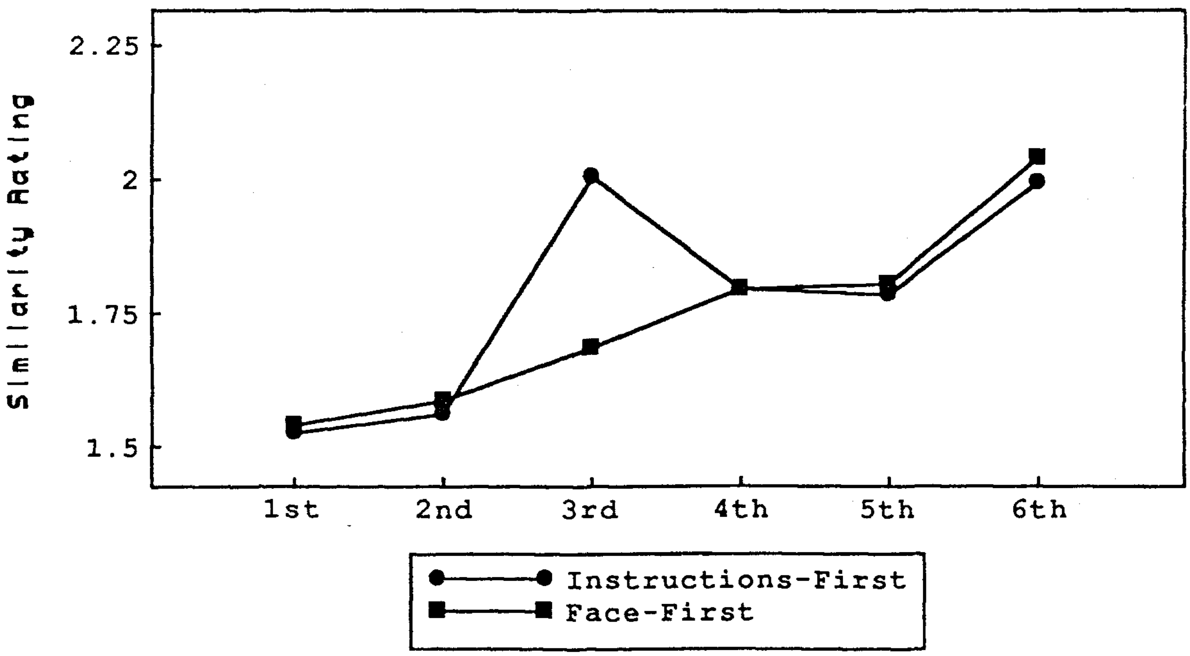


Table 3

Means and pairwise comparisons of the similarity rating scores in the 2 X 6 ANOVA

	Face Order					
Order	1st	2nd	3rd	4th	5th	6th
	(1.5278)	(1.5667)	(1.8389)	(1.7889)	(1.7889)	(2.0111)
1st	X	-	-	-	-	s
2nd	-	X	-	-	-	s
3rd	-	-	X	-	-	-
4th	-	-	-	X	-	-
5th	-	-	-	-	X	-
6th	s	s	-	-	-	X

Note: Fisher's LSD significant differences indicated by "s". Upper triangle differences significant at .05. Lower triangle differences significant at .01.

comparisons using Fisher's LSD (Least Significant Difference) and collapsing across the two groups reveals that the sixth face ($\underline{M} = 2.01$) was rated significantly better than both the first face ($\underline{M} = 1.53$) and the second face ($M = 1.57$) ($\underline{p}$'s $< .01$). There were no other significant differences among the faces. As with the matching scores, there was no significant face order by group interaction ($\underline{F} < 1.0$).

ANOVA by Face Presence. In the next ANOVA the factor of face presence (Memory, In-View) was added to the analysis; but because the first face had no In-View condition, this position was dropped from this analysis. This resulted in a 2 X 5 X 2 mixed-model ANOVA performed on the matching scores with the factors of group (Face-First, Instructions-First), face order (second through sixth faces), and face presence (Memory, In-View). There was no significant main effect for either group or face order ($\underline{F}$'s < 1.0). However, there was a significant effect of face presence. That is the In-View faces ($\underline{M} = .44$) had a significantly higher matching score than the Memory faces ($\underline{M} = .40$), $\underline{F}$ $(1,34) = 4.90$, $\underline{p} < .05$. This ANOVA yielded no significant interactions.

The 2 X 5 X 2 ANOVA was also performed on the similarity rating scores. Again, there was no significant main effect of group ($\underline{F} < 1.0$).

This analysis did reveal a significant main effect for face order, F (4,136) = 3.97, $p < .01$ and a significant main effect for face presence, F (1,34) = 22.78, $p < .001$. In-View faces (M = 2.05) were rated significantly better than Memory faces (M = 1.80). As can be seen in Figure 4, both Memory and In-View faces show a general increase in similarity rating from the second to the sixth faces. Pairwise comparisons among the faces using Fisher's LSD revealed that the sixth face (M = 2.21) was rated significantly higher than the second (M = 1.69), third (M = 1.86), fourth (M = 1.93), and fifth (M = 1.94) faces (p's < .05). Table 4 shows these differences. There were no significant interactions revealed by this ANOVA.

Further Analyses of the Matching Task Data. Due to the failure of the matching task in finding differences among the faces in the above analyses, additional analyses on the matching data were performed. These included comparing the matching results to what would be expected by chance and correlating the matching and rating scores.

Matching performance was compared to what would be expected by chance guessing alone. Here, random guessing would result in a correct

Figure 4

Rating scores for the Face-First and Recognition-First groups on faces done from memory and in-view.

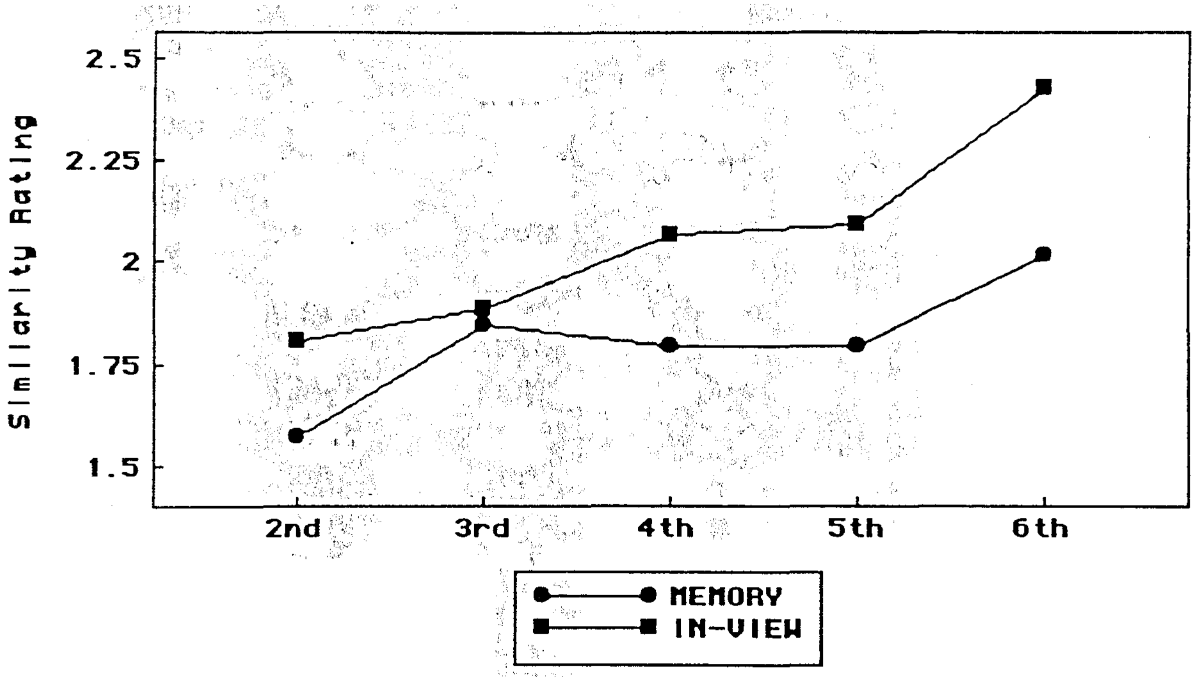


Table 4

Means and pairwise comparisons of the similarity rating scores for face order in the 2 X 5 X 2 ANOVA

	Face Order				
Order	2nd	3rd	4th	5th	6th
	(1.6833)	(1.8583)	(1.9250)	(1.9389)	(2.2139)
2nd	X	-	-	-	s
3rd	-	X	-	-	s
4th	-	-	X	-	s
5th	-	-	-	X	s
6th	s	s	-	-	X

Note: Fisher's LSD significant differences indicated by "s". Upper triangle differences significant at .05. Lower triangle differences significant at .01.

guess once in every six trials (due to the six possible target faces). Thus, chance would be reflected by an accuracy rate of 0.167. For the Face-First group all but the first composite were matched at a rate significantly higher than chance (p's $< .05$). A similar pattern was found with the Instructions-First group. Here, all but the first two composites were matched significantly more often than chance (p's $< .05$).

When examining the relationship between the matching and rating scores, the format of the data made it necessary to perform two analyses. The first of these examined the correlation between the matching and rating scores of the last five faces done from memory, $r = .57$ ($N = 36$), $p < .001$. The second analysis examined the relationship between the matching and rating scores of the last five faces done while in-view, $r = .62$ ($N = 36$), $p < .001$. Only the Face-First and Instructions-First groups were used for these analyses in order to maintain equal numbers for each face position (the Recognition-First group only produced one composite). Both the comparisons to chance and the correlations suggest that the matching task is measuring something similar to what the rating task is measuring. However, the matching task appears to be insufficiently sensitive under the conditions of the current study.

Discussion

Research has shown that current methods of composite construction do not produce accurate likenesses of the target face (Davies, Ellis, & Shepherd, 1978; Ellis, Shepherd, & Davies, 1975; Ellis, Davies, & Shepherd, 1978; Laughery & Fowler, 1980; Wogalter, Laughery, & Thompson, 1988). The present study sought to determine whether training with the Mac-A-Mug Pro composite system would lead to higher quality facial composites. It was hypothesized that subjects in the Instructions-First group would produce more accurate initial composites than subjects in the Face-First group (the between-subjects variable). This difference was only expected for the first composite. The second hypothesis was that subjects later composites would be more accurate than their early composites (within-subjects variable). The Recognition-First group was included in the experimental design to try to determine the effect of a recognition task on subsequent composite construction quality. For this reason the Recognition-First group produced the initial composite only.

There were no significant differences among the three groups in the quality of the initial composite for either the matching or rating scores.

The lack of significant differences among these groups (specifically between the Instructions-First and Face-First groups) fails to support one of the hypotheses. That is, subjects in the Instructions-First group did not produce initial composites that were of higher quality than the initial composites for the Face-First group. This finding can be taken as evidence that learning the composite system does not interfere with the image of the target face. However, the time between exposure to the target face and the beginning of the composite generation was very short for both groups. Perhaps if the delay had been somewhat longer (as would occur in a realistic situation) the effect of learning the system would have interfered to a greater extent.

Analyses failed to find any effect of face order using the matching scores. The only significant effect found was that in-view composites had a higher matching score than composites done from memory. However, both of the ANOVAs revealed a significant effect for face order using the rating scores. That is, composite accuracy increased from the early to the late composites. These findings supports the notion that training with the composite system leads to higher quality composites.

Heretofore, research has failed to show any effect of training on the ability to recognize faces (Woodhead et al., 1979) with the exception of being able to erase deficits (Ellis et al., 1973; Malpass et al., 1973; Lavrakas et al., 1976). However, Woodhead et al., attribute their lack of success to the training procedure that they used. Their procedure involved analyzing the face in terms of individual features, a situation that should lead to improved recall according to Wells and Hryciw, (1984). Had Woodhead and his colleagues measured memory using a recall procedure (such as composite construction), they may have obtained a significant effect due to the training. In addition, the improvement found in the present study can be seen as overcoming a deficit. Recognition is a daily process and one that is probably overlearned (Malpass, 1981). On the other hand, people are seldom required to perform a recall task (such as a composite generation). This may also help to explain why training can facilitate recall performance but have very little effect on recognition performance.

Results of the current study suggest that the quality of recall measures (i.e., composite likenesses) can be improved through training. Yet, it is important to note that the present study did not train subjects in methods to remember faces better but was designed to train them with the system, in order to allow them to reconstruct the face more accurately. Thus, subjects may not have been better at remembering the face but were simply able to use the composite system better to reconstruct what they had encoded. However, it is possible that the use of the system influenced subjects to alter their encoding strategy and adopt a more useful technique. Because the present study did not ask subjects which encoding strategy that they employed, it is not possible to state that the current findings support the theory of encoding specificity as proposed by Wells and Hryciw (1984). This question could be addressed by having subjects report the encoding strategy that they use as they progress through the session and examining the changes, if any, in their preferred encoding technique.

Using the Photofit system Ellis et al., (1975; 1978) found no difference in the quality of composite likenesses constructed from memory and those done with the face in-view. The present results showed that faces constructed with the target face in-view were rated as being significantly more accurate than composites generated from memory. In addition, the in-view faces showed a general increase in similarity ratings from the second to the sixth faces. That is, even the in-view composites suggest a positive effect of training and practice. These findings suggest that the Mac-A-Mug Pro system may be a superior composite generating system and more conducive to the production of accurate composite likenesses.

The present pattern of results suggests that the rating task is more sensitive as an accuracy measure than the matching task. The matching task failed to note any differences among the composites as a function of the independent variables, with the exception of the in-view faces being matched more often than the memory faces. However, further analyses on the matching data suggests that this task was highly correlated with the rating task. Further, most of the composites were correctly matched at a rate significantly higher than would be expected by chance. This shows that the matching task was indeed measuring the desired effect but was not sufficiently sensitive to pinpoint differences in the current design. Perhaps a larger number of judges would have provided more power to detect differences.

The results of the recognition task indicate that there were no differences among the Face-First, Instructions-First, and the Recognition-First groups in the ability to recognize the target slide from the series of distractor slides. This suggests that a recognition task does not have a detrimental effect on subsequent composite quality. Previous research has examined whether composite construction will affect future recognition ability (Davis, Ellis, & Shepherd, 1978; Hall, 1977; Mauldin & Laughery, 1981; Wogalter, Laughery, & Thompson, 1988). The findings in this area remain equivocal. However, no research has examined the effect of recognition tasks on composite quality. The findings of the current suggest that composite quality is not harmed by participation in an earlier recognition task. This area of research has implications for the ordering of events when witnesses are required to perform multiple identification tasks.

Results of the present study may have an impact on law enforcement personnel and the training of potential witnesses. These results suggest that familiarization and practice with a composite system can allow the witness to produce higher quality composites. Although training with the system prior to exposure to the target face did not increase the quality of the initial composites, the within-subjects variable of practice or face order did have a significant positive effect on composite quality. That is, significant improvement was found after only three hours of training. Employees at high risk for witnessing a crime could undergo training with the composite system and if called upon to generate a composite likeness, they would be prepared. At the very least, the current findings suggest that the witness should be completely familiar with the composite system before attempting to generate a composite likeness.

The current results lead to many possible questions that need to be addressed before any substantial conclusions can be drawn. First, does training with one composite system facilitate performance if one is called upon to use another system? This question could be addressed using a simple experimental design requiring subjects to be trained in one composite technique, and then having them generate a composite from a second system. These composites could then be compared to the composites generated from a second group using the alternate system for the first time with no training. The presence of such a transfer effect would suggest that there is some change or improvement in subjects' encoding strategy that leads to better recall, rather than merely familiarization with a system. This notion of encoding specificity (c f , Wells & Hryciw, 1984) would be further supported if self-report measures of subjects' encoding strategies were obtained and it was found that they actually did alter their memory tactics toward a more feature based analysis in order to improve composite quality.

The ideas mentioned above lead one to another possible area of research. Support for the theory of encoding specificity would suggest that witnesses should utilize separate memory techniques for composite construction and lineup recognition. Training in feature analysis (Woodhead et al., 1979) might possibly lead to better memory if recall measures are used. However, at the time of a crime, the witness does not know what type of task will be asked of him/her. Use of one memory technique may actually decrease performance if the memory task is not congruent with the means of encoding (Wells & Hryciw, 1984). These questions must surely be addressed in future research.

Current findings indicate that training with a composite system leads to higher quality composite likenesses. Although training has had no positive effect on recognition ability, the confounding factors discussed above certainly merit attention. This area is one that is important in today's society and one that must continue to be explored in order to fully understand the factors and mechanisms involved in both face memory and eyewitness identification.

References

Baddeley, A., & Woodhead, M. (1982). Depth of processing, context, and face recognition. Canadian Journal of Psychology, 36, 148-164.

Bower, G. H., & Karlin, M. B. (1974). Depth of processing pictures of faces and recognition memory. Journal of Experimental Psychology, 103, 751-757.

Craik, F. I. M., & Lockhart, R. S. (1972). Levels of processing: A framework for memory research. Journal of Verbal Learning and Verbal Behavior, 11, 671-684.

Craik, F. I. M., & Tulving, E. (1975). Depth of processing and the retention of words in episodic memory. Journal of Experimental Psychology: General, 104, 268-294.

Davies, G. M., Ellis, H. D., & Shepherd, J. W. (1978). Face identification: The influence of delay upon accuracy of Photofit construction. Journal of Police Science and Administration, 6, 35-42.

Elliott, E. S., Wills, E. J., & Goldstein, A. G. (1973). The effects of discrimination training on the recognition of white and oriental faces. Bulletin of the Psychonomic Society, 2, 71-73.

Ellis, H. D., Davies, G. M., & Shepherd, J. W. (1978). A critical examination of the Photofit system for recalling faces. Ergonomics, 21, 297-307.

Ellis, H. D., Shepherd, J. W., & Davies, G. M. (1975). An investigation of the use of the Photofit technique for recalling faces. British Journal of Psychology, 66, 29-37.

Fisher, R. P., & Craik, F. I. M. (1980). The effects of elaboration on recognition memory. Memory and Cognition, 8, 400-404.

Hall, D. F. (1977). Obtaining eyewitness identifications in criminal identifications: Two experiments and some comments on the Zeitgeist in forensic psychology. Paper presented at the meeting of the American Psychology-Law Society.

Laughery, K. R., & Fowler, R. F. (1980). Sketch artist and Identi-kit procedures for recalling faces. Journal of Applied Psychology, 65, 307-316.

Laughery, K. R., & Smith, V. L. (1978). Suspect identification following exposure to sketches and Identi-kit composites. In Proceedings of the Human Factors Society 22nd Annual Meeting (pp. 631-635). Santa Monica: The Human Factors Society.

Laughery, K. R., Smith, V. L., & Yount, M. B. (1980). Visual support devices: Evaluation of a new technique for constructing facial images. In Proceedings of the Human Factors Society 24th Annual Meeting (pp. 302-305). Santa Monica: The Human Factors Society.

Lavrakas, P. J., Buri, J. R., & Mayzner, M. S. (1976). A perspective on the recognition of other race faces. Perception and Psychophysics, 20, 475-481.

Malpass, R. (1981). Training in face recognition. In G. M. Davies, H. D. Ellis, & J. W. Shepherd (Eds.), Perceiving and remembering faces (pp. 299-309). London: Academic Press.

Mauldin, M. M., & Laughery, K. R. (1981). Composite production effects on subsequent facial recognition. Journal of Applied Psychology, 66, 351-157.

Malpass, R. S., Lavigueur, H., & Weldon, D. E. (1973). Verbal and visual training in face recognition. Perception and Psychophysics, 14, 285-292.

Patterson, K. E., & Baddeley, A. D. (1977). When face recognition fails. Journal of Experimental Psychology: Human Learning and Memory, 3, 406-417.

Penry, J. (1970). Photofit kit. Leeds, England: John Waddington of

Kirkstall Ltd.

Penry, J. (1971). Looking at faces and remembering them. London: Elek Books.

Strnad, B. N., & Mueller, J. H. (1977). Levels of processing in facial recognition memory. Bulletin of the Psychonoomic Society, 9, 17-18.

Wells, G. L., & Hryciw, B. (1984). Memory for faces: Encoding and retrieval operations. Memory and Cognition, 12, 338-344.

Winograd, E. (1976). Recognition memory for faces following nine different judgments. Bulletin of the Psychonomic Society, 8, 419-421.

Winograd, E. (1978). Encoding operations which facilitate memory for faces across the life span. In M. M. Gruneberg, P. E. Morris, and R. N. Sykes (Eds.), Practical aspects of memory. London: Academic Press.

Wogalter, M. S., Laughery, K. R., & Thompson, B. G. (1988). Eyewitness identification: Composite construction on subsequent recognition performance. Unpublished manuscript. University of Richmond, VA.

Woodhead, M. M., Baddeley, A. D., & Simmonds, D. C. V. (1979). On training people to recognize faces. Ergonomics, 22, 333-343.

Appendix A: Raw Data

	OBSERVATION	SUBJECT	GROUP	FACE STUDIED	TARGET (HIT-MISS)	MN FALSE ALARM (FACA)
1	1	1	1	1	6	1.64557
2	2	2	1	1	6	1.25316
3	3	3	1	2	5	1.83544
4	4	4	1	2	2	1.07595
5	5	5	1	3	6	1.05063
6	6	6	1	3	6	1.91139
7	7	7	1	4	5	1.46835
8	8	8	1	4	6	1.07595
9	9	9	1	1	2	1.08861
10	10	11	1	6	6	1.00000
11	11	12	1	6	6	1.16456
12	12	13	2	1	6	2.50633
13	13	14	2	1	1	1.30380
14	14	15	2	2	1	1.17722
15	15	16	2	2	6	1.02532
16	16	17	2	3	6	1.40506
17	17	18	2	3	6	1.05063
18	18	19	2	4	2	2.07595
19	19	20	2	4	6	1.13924
20	20	21	2	4	4	1.49367
21	21	23	2	6	5	1.44304
22	22	24	2	6	1	1.37975
23	23	25	3	1	1	1.46835
24	24	26	3	1	6	1.12658
25	25	27	3	2	6	1.00000
26	26	28	3	2	6	1.00000
27	27	29	3	3	6	1.03797
28	28	30	3	3	6	1.00000
29	29	31	3	4	6	2.07595
30	30	32	3	4	1	1.39241
31	31	33	3	5	6	1.00000
32	32	34	3	5	5	1.00000
33	33	35	3	6	4	1.62025
34	34	36	3	6	6	1.00000
35	35	37	1	5	6	1.06329
36	36	39	3	2	6	1.11392
37	37	40	2	5	6	1.46835
38	38	41	2	5	3	1.32911
39	39	42	3	3	6	1.59494
40	40	43	1	5	5	2.25316
41	41	44	1	2	2	1.00000
42	42	45	2	2	6	1.08861

	OBSERVATION	SUBJECT	GROUP	FACE STUDIED	TARGET (HIT-MISS)	MN FALSE ALARM (FACR)
43	43	46	1	3	6	1.05063
44	44	47	2	3	6	1.02532
45	45	48	2	1	6	1.12658
46	46	49	1	5	6	1.00000
47	47	50	2	5	6	1.00000
48	48	51	3	1	4	1.10127
49	49	52	3	4	6	1.00000
50	50	53	3	5	6	1.02532
51	51	54	1	4	6	1.00000
52	52	55	1	6	6	1.00000
53	53	56	2	6	6	1.18987
54	54	57	3	6	5	1.30380

	HM/FACR DIFF	PROPORTION HIT	PROP FALSE ALARM (PFA)	STANDARDIZED HIT-MISS (SHM)
1	4.35443	1	.06329	3.73337
2	4.74684	1	.03797	4.80487
3	3.16456	1	.06329	3.05337
4	.92405	0	0	3.20908
5	4.94937	1	0	8.21142
6	4.08861	1	.10127	3.57279
7	3.53165	1	.03797	3.23194
8	4.92405	1	.01266	6.14363
9	.91139	0	.01266	1.73735
10	5.00000	1	0	8.83247
11	4.83544	1	0	7.07844
12	3.49367	1	.20253	2.77849
13	-.30380	0	.01266	-.38977
14	-.17722	0	0	-.35179
15	4.97468	1	0	8.49996
16	4.59494	1	.08861	3.99549
17	4.94937	1	.01266	7.45145
18	-.07595	0	.21519	-.05380
19	4.86076	1	0	7.23211
20	2.50633	1	.03797	2.59342
21	3.55696	1	.05063	3.78630
22	-.37975	0	.02532	-.48748
23	-.46835	0	.02532	-.59404
24	4.87342	1	0	7.31561
25	5.00000	1	0	8.83247
26	5.00000	1	0	8.83247
27	4.96203	1	0	8.35074
28	5.00000	1	0	8.83247
29	3.92405	1	.13924	3.10867
30	-.39241	0	.03797	-.47315
31	5.00000	1	0	8.83247
32	4.00000	1	0	8.83247
33	2.37975	1	.11392	2.17528
34	5.00000	1	0	8.83247
35	4.93671	1	0	7.57151
36	4.88608	1	.01266	6.81927
37	4.53165	1	.02532	5.05343
38	1.67089	0	.05063	1.85953
39	4.40506	1	.03797	3.98361
40	2.74684	1	.16456	2.48157
41	1.00000	0	0	8.83247
42	4.91139	1	0	7.59674

	HM/FACR DIFF	PROPORTION HIT	PROP FALSE ALARM (PFA)	STANDARDIZED HIT-MISS (SHM)
43	4.94937	1	.01266	6.86971
44	4.97468	1	0	8.49996
45	4.87342	1	.01266	5.70643
46	5.00000	1	0	8.83247
47	5.00000	1	0	8.83247
48	2.89873	1	0	6.08408
49	5.00000	1	0	8.83247
50	4.97468	1	0	8.49996
51	5.00000	1	0	8.83247
52	5.00000	1	0	8.83247
53	4.81013	1	0	6.76044
54	3.69620	1	0	5.39203

	Prop Hit-Prop FA	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	R1
1	.93671	1	0	2	1	2	1	3	0	0	0	1	7
2	.96202	1	3	3	0	3	3	3	4	3	0	0	6
3	.93671	4	1	1	5	3	1	1	0	3	1	3	9
4	0	0	3	1	2	3	0	0	2	1	2	1	0
5	1.00000	0	4	4	3	2	0	2	3	4	4	3	5
6	.89873	1	0	2	0	1	0	2	4	1	5	4	9
7	.96202	3	1	2	3	1	1	1	4	4	1	0	4
8	.98734	3	1	2	3	1	1	1	4	4	1	0	7
9	-.01266	0	0	3	2	3	3	4	1	1	1	4	2
10	1.00000	0	3	5	4	4	2	4	1	1	3	1	6
11	1.00000	1	4	5	5	4	3	3	3	2	1	0	9
12	.79747	2	2	3	0	2	3	4	3	2	1	2	6
13	-.01266	1	4	4	4	2	4	4	3	1	0	1	6
14	0	0	1	1	5	2	0	1	1	1	1	3	3
15	1.00000	3	4	0	4	4	1	0	0	0	2	3	9
16	.91139	2	0	2	1	0	0	0	4	2	1	1	5
17	.98734	0	2	3	1	3	0	0	3	3	3	4	5
18	-.21519	4	0	1	3	1	1	1	5	3	0	1	10
19	1.00000	5	0	2	3	2	2	0	4	5	1	4	1
20	.96202	0	1	1	0	1	0	2	1	0	2	1	15
21	.94937	3	1	4	1	4	3	1	1	0	3	4	10
22	-.02532	2	4	5	3	5	0	3	1	0	0	2	3
23	-.02532	0	•	•	•	•	•	•	•	•	•	•	7
24	1.00000	3	•	•	•	•	•	•	•	•	•	•	7
25	1.00000	4	•	•	•	•	•	•	•	•	•	•	5
26	1.00000	4	•	•	•	•	•	•	•	•	•	•	5
27	1.00000	2	•	•	•	•	•	•	•	•	•	•	9
28	1.00000	1	•	•	•	•	•	•	•	•	•	•	8
29	.86076	2	•	•	•	•	•	•	•	•	•	•	3
30	-.03797	3	•	•	•	•	•	•	•	•	•	•	5
31	1.00000	1	•	•	•	•	•	•	•	•	•	•	10
32	1.00000	0	•	•	•	•	•	•	•	•	•	•	4
33	.88608	1	•	•	•	•	•	•	•	•	•	•	12
34	1.00000	1	•	•	•	•	•	•	•	•	•	•	1
35	1.00000	2	4	5	0	0	4	3	0	0	3	4	11
36	.98734	4	•	•	•	•	•	•	•	•	•	•	5
37	.97468	1	0	2	1	0	0	1	0	2	4	4	14
38	-.05063	0	1	2	0	3	5	5	4	3	4	4	9
39	.96202	0	•	•	•	•	•	•	•	•	•	•	6
40	.83544	0	3	1	0	1	5	4	3	4	4	4	7
41	0	3	0	3	4	4	0	0	2	1	2	4	6
42	1.00000	3	0	3	3	2	0	0	0	0	1	3	6

	Prop Hit-Prop FA	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	R1
43	.98734	1	1	3	1	1	2	1	4	3	5	3	9
44	1.00000	0	3	3	0	0	1	0	4	4	4	4	6
45	.98734	0	2	4	4	1	5	4	1	1	1	0	6
46	1.00000	1	2	0	0	0	3	5	1	2	4	3	13
47	1.00000	3	0	1	1	1	5	4	2	3	2	4	12
48	1.00000	2	•	•	•	•	•	•	•	•	•	•	7
49	1.00000	4	•	•	•	•	•	•	•	•	•	•	15
50	1.00000	0	•	•	•	•	•	•	•	•	•	•	12
51	1.00000	4	1	0	1	5	4	3	4	4	1	1	16
52	1.00000	1	4	5	2	0	1	1	0	4	3	2	11
53	1.00000	0	5	3	3	4	4	2	3	1	0	3	12
54	1.00000	2	•	•	•	•	•	•	•	•	•	•	10

	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	SUB#	MM1	MM2	MM3
1	7	3	7	6	3	7	7	9	9	8	1	.200	0	.400
2	6	9	3	1	6	5	8	6	7	9	2	.200	.600	.600
3	3	2	8	11	9	9	7	10	6	14	3	.800	.200	.200
4	4	6	9	9	4	8	3	5	2	3	4	0	.600	.200
5	17	19	11	14	8	13	9	12	9	14	5	0	.800	.800
6	5	6	8	9	5	6	11	11	11	15	6	.200	0	.400
7	8	6	7	9	7	6	9	9	13	14	7	.600	.200	.400
8	10	3	10	8	8	9	6	7	13	13	8	.600	.200	.400
9	4	12	8	10	5	6	12	14	9	12	9	0	0	.600
10	13	9	10	11	14	14	10	13	13	12	11	0	.600	1.000
11	7	16	15	10	13	14	6	14	8	11	12	.200	.800	1.000
12	12	7	7	9	10	12	12	13	13	17	13	.400	.400	.600
13	5	11	10	8	9	13	15	17	14	18	14	.200	.800	.800
14	9	8	10	7	8	7	7	8	6	11	15	0	.200	.200
15	9	2	2	4	5	5	9	8	8	7	16	.600	.800	0
16	10	12	7	8	9	12	10	11	6	4	17	.400	0	.400
17	11	11	5	10	13	14	5	6	12	17	18	0	.400	.600
18	0	5	6	8	4	5	9	6	10	8	19	.800	0	.200
19	5	5	14	4	1	3	6	5	7	4	20	1.000	0	.400
20	3	9	13	12	5	9	4	3	4	12	21	0	.200	.200
21	7	8	12	16	14	18	12	14	13	13	23	.600	.200	.800
22	13	14	7	9	10	13	11	13	10	12	24	.400	.800	1.000
23	•	•	•	•	•	•	•	•	•	•	25	0	•	•
24	•	•	•	•	•	•	•	•	•	•	26	.600	•	•
25	•	•	•	•	•	•	•	•	•	•	27	.800	•	•
26	•	•	•	•	•	•	•	•	•	•	28	.800	•	•
27	•	•	•	•	•	•	•	•	•	•	29	.400	•	•
28	•	•	•	•	•	•	•	•	•	•	30	.200	•	•
29	•	•	•	•	•	•	•	•	•	•	31	.400	•	•
30	•	•	•	•	•	•	•	•	•	•	32	.600	•	•
31	•	•	•	•	•	•	•	•	•	•	33	.200	•	•
32	•	•	•	•	•	•	•	•	•	•	34	0	•	•
33	•	•	•	•	•	•	•	•	•	•	35	.200	•	•
34	•	•	•	•	•	•	•	•	•	•	36	.200	•	•
35	14	15	16	8	10	9	5	6	8	7	37	.400	.800	1.000
36	•	•	•	•	•	•	•	•	•	•	39	.800	•	•
37	6	12	11	10	1	3	7	8	7	11	40	.200	0	.400
38	7	12	9	12	11	9	11	14	16	14	41	0	.200	.400
39	•	•	•	•	•	•	•	•	•	•	42	0	•	•
40	3	6	9	12	14	12	12	15	17	14	43	0	.600	.200
41	7	8	16	20	10	12	3	4	17	17	44	.600	0	.600
42	4	7	3	3	5	10	0	5	9	14	45	.600	0	.600

	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	SUB#	MM1	MM2	MM3
43	2	4	5	7	7	15	16	14	8	9	46	.200	.200	.600
44	10	10	8	8	13	13	14	17	15	14	47	0	.600	.600
45	6	9	3	5	15	14	8	13	10	14	48	0	.400	.800
46	9	6	11	10	16	13	13	15	7	17	49	.200	.400	0
47	14	9	10	13	13	10	11	14	11	14	50	.600	0	.200
48	•	•	•	•	•	•	•	•	•	•	51	.400	•	•
49	•	•	•	•	•	•	•	•	•	•	52	.000	•	•
50	•	•	•	•	•	•	•	•	•	•	53	0	•	•
51	8	14	12	13	9	15	14	14	11	13	54	.800	.200	0
52	13	17	15	11	13	13	9	12	11	15	55	.200	.800	1.000
53	11	12	14	13	15	15	11	11	12	14	56	0	1.000	.600
54	•	•	•	•	•	•	•	•	•	•	57	.400	•	•

	MM4	MM5	MM6	MM7	MM8	MM9	MM10	MM11	RR1	RR2	RR3	RR4
1	.200	.400	.200	.600	0	0	0	.200	1.400	1.400	.600	1.400
2	0	.600	.600	.600	.800	.600	0	0	1.200	1.200	1.800	.600
3	1.000	.600	.200	.200	0	.600	.200	.600	1.800	.600	.400	1.600
4	.400	.600	0	0	.400	.200	.400	.200	0	.800	1.200	1.800
5	.600	.400	0	.400	.600	.800	.800	.600	1.000	3.400	3.800	2.200
6	0	.200	0	.400	.800	.200	1.000	.800	1.800	1.000	1.200	1.600
7	.600	.200	.200	.200	.800	.800	.200	0	.800	1.600	1.200	1.400
8	.600	.200	.200	.200	.800	.800	.200	0	1.400	2.000	.600	2.000
9	.400	.600	.600	.800	.200	.200	.200	.800	.400	.800	2.400	1.600
10	.800	.800	.400	.800	.200	.200	.600	.200	1.200	2.600	1.800	2.000
11	1.000	.800	.600	.600	.600	.400	.200	0	1.800	1.400	3.200	3.000
12	0	.400	.600	.800	.600	.400	.200	.400	1.200	2.400	1.400	1.400
13	.800	.400	.800	.800	.600	.200	0	.200	1.200	1.000	2.200	2.000
14	1.000	.400	0	.200	.200	.200	.200	.600	.600	1.800	1.600	2.000
15	.800	.800	.200	0	0	0	.400	.600	1.800	1.800	.400	.400
16	.200	0	0	0	.800	.400	.200	.200	1.000	2.000	2.400	1.400
17	.200	.600	0	0	.600	.600	.600	.800	1.000	2.200	2.200	1.000
18	.600	.200	.200	.200	1.000	.600	0	.200	2.000	0	1.000	1.200
19	.600	.400	.400	0	.800	1.000	.200	.800	.200	1.000	1.000	2.800
20	0	.200	0	.400	.200	0	.400	.200	3.000	.600	1.800	2.600
21	.200	.800	.600	.200	.200	0	.600	.800	2.000	1.400	1.600	2.400
22	.600	1.000	0	.600	.200	0	0	.400	.600	2.600	2.800	1.400
23	•	•	•	•	•	•	•	•	1.400	•	•	•
24	•	•	•	•	•	•	•	•	1.400	•	•	•
25	•	•	•	•	•	•	•	•	1.000	•	•	•
26	•	•	•	•	•	•	•	•	1.000	•	•	•
27	•	•	•	•	•	•	•	•	1.800	•	•	•
28	•	•	•	•	•	•	•	•	1.600	•	•	•
29	•	•	•	•	•	•	•	•	.600	•	•	•
30	•	•	•	•	•	•	•	•	1.000	•	•	•
31	•	•	•	•	•	•	•	•	2.000	•	•	•
32	•	•	•	•	•	•	•	•	.800	•	•	•
33	•	•	•	•	•	•	•	•	2.400	•	•	•
34	•	•	•	•	•	•	•	•	.200	•	•	•
35	0	0	.800	.600	0	0	.600	.800	2.200	2.800	3.000	3.200
36	•	•	•	•	•	•	•	•	1.000	•	•	•
37	.200	0	0	.200	0	.400	.800	.800	2.800	1.200	2.400	2.200
38	0	.600	1.000	1.000	.800	.600	.800	.800	1.800	1.400	2.400	1.800
39	•	•	•	•	•	•	•	•	1.200	•	•	•
40	0	.200	1.000	.800	.600	.800	.800	.800	1.400	.600	1.200	1.800
41	.800	.800	0	0	.400	.200	.400	.800	1.200	1.400	1.600	3.200
42	.600	.400	0	0	0	0	.200	.600	1.200	.800	1.400	.600

	MM4	MM5	MM6	MM7	MM8	MM9	MM10	MM11	RR1	RR2	RR3	RR4
43	.200	.200	.400	.200	.800	.600	1.000	.600	1.800	.400	.800	1.000
44	0	0	.200	0	.800	.800	.800	.800	1.200	2.000	2.000	1.600
45	.800	.200	1.000	.800	.200	.200	.200	0	1.200	1.200	1.800	.600
46	0	0	.600	1.000	.200	.400	.800	.600	2.600	1.800	1.200	2.200
47	.200	.200	1.000	.800	.400	.600	.400	.800	2.400	2.800	1.800	2.000
48	•	•	•	•	•	•	•	•	1.400	•	•	•
49	•	•	•	•	•	•	•	•	3.000	•	•	•
50	•	•	•	•	•	•	•	•	2.400	•	•	•
51	.200	1.000	.800	.600	.800	.800	.200	.200	3.200	1.600	2.800	2.400
52	.400	0	.200	.200	0	.800	.600	.400	2.200	2.600	3.400	3.000
53	.600	.800	.800	.400	.600	.200	0	.600	2.400	2.200	2.400	2.800
54	•	•	•	•	•	•	•	•	2.000	•	•	•

	RR5	RR6	RR7	RR8	RR9	RR10	RR11	MnMem6-Match	MnMem5-Match
1	1.200	.600	1.400	1.400	1.800	1.800	1.600	.100	.080
2	.200	1.200	1.000	1.600	1.200	1.400	1.800	.367	.400
3	2.200	1.800	1.800	1.400	2.000	1.200	2.800	.400	.320
4	1.800	.800	1.600	.600	1.000	.400	.600	.300	.360
5	2.800	1.600	2.600	1.800	2.400	1.800	2.800	.467	.560
6	1.800	1.000	1.200	2.200	2.200	2.200	3.000	.333	.360
7	1.800	1.400	1.200	1.800	1.800	2.600	2.800	.433	.400
8	1.600	1.600	1.800	1.200	1.400	2.600	2.600	.433	.400
9	2.000	1.000	1.200	2.400	2.800	1.800	2.400	.233	.280
10	2.200	2.800	2.800	2.000	2.600	2.600	2.400	.433	.520
11	2.000	2.600	2.800	1.200	2.800	1.600	2.200	.567	.640
12	1.800	2.000	2.400	2.400	2.600	2.600	3.400	.367	.360
13	1.600	1.800	2.600	3.000	3.400	2.800	3.600	.533	.600
14	1.400	1.600	1.400	1.400	1.600	1.200	2.200	.267	.320
15	.800	1.000	1.000	1.800	1.600	1.600	1.400	.467	.440
16	1.600	1.800	2.400	2.000	2.200	1.200	.800	.267	.240
17	2.000	2.600	2.800	1.000	1.200	2.400	3.400	.300	.360
18	1.600	.800	1.000	1.800	1.200	2.000	1.600	.433	.360
19	.800	.200	.600	1.200	1.000	1.400	.800	.500	.400
20	2.400	1.000	1.800	.800	.600	.800	2.400	.133	.160
21	3.200	2.800	3.600	2.400	2.800	2.600	2.600	.400	.360
22	1.800	2.000	2.600	2.200	2.600	2.000	2.400	.333	.320
23	•	•	•	•	•	•	•	0	•
24	•	•	•	•	•	•	•	.600	•
25	•	•	•	•	•	•	•	.800	•
26	•	•	•	•	•	•	•	.800	•
27	•	•	•	•	•	•	•	.400	•
28	•	•	•	•	•	•	•	.200	•
29	•	•	•	•	•	•	•	.400	•
30	•	•	•	•	•	•	•	.600	•
31	•	•	•	•	•	•	•	.200	•
32	•	•	•	•	•	•	•	0	•
33	•	•	•	•	•	•	•	.200	•
34	•	•	•	•	•	•	•	.200	•
35	1.600	2.000	1.800	1.000	1.200	1.600	1.400	.433	.440
36	•	•	•	•	•	•	•	.800	•
37	2.000	.200	.600	1.400	1.600	1.400	2.200	.200	.200
38	2.400	2.200	1.800	2.200	2.800	3.200	2.800	.467	.560
39	•	•	•	•	•	•	•	0	•
40	2.400	2.800	2.400	2.400	3.000	3.400	2.800	.500	.600
41	4.000	2.000	2.400	.600	.800	3.400	3.400	.367	.320
42	.600	1.000	2.000	0	1.000	1.800	2.800	.233	.160

	RR5	RR6	RR7	RR8	RR9	RR10	RR11	MnMem6-Match	MnMem5-Match
43	1.400	1.400	3.000	3.200	2.800	1.600	1.800	.467	.520
44	1.600	2.600	2.600	2.800	3.400	3.000	2.800	.400	.480
45	1.000	3.000	2.800	1.600	2.600	2.000	2.800	.433	.520
46	2.000	3.200	2.600	2.600	3.000	1.400	3.400	.367	.400
47	2.600	2.600	2.000	2.200	2.800	2.200	2.800	.433	.400
48	•	•	•	•	•	•	•	.400	•
49	•	•	•	•	•	•	•	.000	•
50	•	•	•	•	•	•	•	0	•
51	2.600	1.800	3.000	2.800	2.800	2.200	2.600	.500	.440
52	2.200	2.600	2.600	1.800	2.400	2.200	3.000	.367	.400
53	2.600	3.000	3.000	2.200	2.200	2.400	2.800	.500	.600
54	•	•	•	•	•	•	•	.400	•

	MnView5-Match	MnMem6-Rating	MnMem5-Rating	MnView5-Rating
1	.320	1.333	1.320	1.320
2	.480	1.200	1.200	1.200
3	.440	1.400	1.320	1.840
4	.240	.733	.880	1.240
5	.600	1.967	2.160	2.880
6	.400	1.633	1.600	1.880
7	.320	1.600	1.760	1.760
8	.320	1.800	1.880	1.600
9	.600	1.333	1.520	2.160
10	.600	2.200	2.400	2.360
11	.560	1.933	1.960	2.600
12	.520	2.000	2.160	2.320
13	.480	1.967	2.120	2.680
14	.320	1.433	1.600	1.640
15	.280	1.400	1.320	1.040
16	.200	1.567	1.680	1.880
17	.520	1.700	1.840	2.320
18	.280	1.300	1.160	1.280
19	.520	1.133	1.320	.840
20	.200	1.467	1.160	1.800
21	.520	2.267	2.320	2.760
22	.600	1.800	2.040	2.440
23	•	1.400	•	•
24	•	1.400	•	•
25	•	1.000	•	•
26	•	1.000	•	•
27	•	1.800	•	•
28	•	1.600	•	•
29	•	.600	•	•
30	•	1.000	•	•
31	•	2.000	•	•
32	•	.800	•	•
33	•	2.400	•	•
34	•	.200	•	•
35	.480	2.133	2.120	1.800
36	•	1.000	•	•
37	.360	1.533	1.280	1.760
38	.680	2.100	2.160	2.440
39	•	1.200	•	•
40	.560	2.067	2.200	2.360
41	.480	1.967	2.120	2.440
42	.320	.900	.840	1.560

	MnView5-Match	MnMem6-Rating	MnMem5-Rating	MnView5-Rating
43	.440	1.567	1.520	1.960
44	.440	2.200	2.400	2.480
45	.400	1.600	1.680	2.200
46	.400	2.300	2.240	2.440
47	.520	2.367	2.360	2.400
48	•	1.400	•	•
49	•	3.000	•	•
50	•	2.400	•	•
51	.520	2.333	2.160	2.760
52	.480	2.400	2.440	2.720
53	.520	2.500	2.520	2.600
54	•	2.000	•	•

Appendix B: Analysis of Variance (Matching and Rating) for the First Face of all Three Groups

MARWITZ THESIS - FACE COMPOSITE LEARNING DATA

One Factor ANOVA X_1 : GROUP Y_1 : RR1

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	.064	.032	.056
Within groups	51	28.956	.568	p = .9455
Total	53	29.019		

Model II estimate of between component variance = -.268

One Factor ANOVA X_1 : GROUP Y_1 : RR1

Group:	Count:	Mean:	Std. Dev.:	Std. Error:
Group 1	18	1.522	.764	.18
Group 2	18	1.533	.785	.185
Group 3	18	1.456	.709	.167

One Factor ANOVA X_1 : GROUP Y_1 : RR1

Comparison:	Mean Diff.:	Fisher PLSD:	Scheffe F-test:	Dunnett t:
Group 1 vs. 2	-.011	.504	.001	.044
Group 1 vs. 3	.067	.504	.035	.265
Group 2 vs. 3	.078	.504	.048	.31

3 GROUPS - FIRST FACE Constructed - Rating Data

MARWITZ THESIS - FACE COMPOSITE LEARNING DATA

One Factor ANOVA X_1 : GROUP Y_1 : MM1

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	.073	.036	.404
Within groups	51	4.58	.09	p = .6696
Total	53	4.653		

Model II estimate of between component variance = -.027

One Factor ANOVA X_1 : GROUP Y_1 : MM1

Group:	Count:	Mean:	Std. Dev.:	Std. Error:
Group 1	18	.289	.276	.065
Group 2	18	.322	.323	.076
Group 3	18	.378	.298	.07

One Factor ANOVA X_1 : GROUP Y_1 : MM1

Comparison:	Mean Diff.:	Fisher PLSD:	Scheffe F-test:	Dunnett t:
Group 1 vs. 2	-.033	.201	.056	.334
Group 1 vs. 3	-.089	.201	.396	.89
Group 2 vs. 3	-.056	.201	.155	.556

3 GROUPS - FIRST FACE Constructed - Matching Data

Appendix C: Analysis of Variance of Matching Scores

(Faces 1-6 done from memory for Face-First and

Instructions-First Groups)

ANOVA Summary Table for Relax/SeagateU:•STUDENT FOLDERS:MARW112 THESIS NEWER:MARW THESIS 6 FACE MATCHING

Source of Variation	df	Sum of Squares	Mean Square	F	p	Epsilon Correction
A	1	.027	.027	.359	.5531	
Error	34	2.526	.074			
B	5	.393	.079	.694	.6287	
AB	5	.147	.029	.259	.9346	
Error	170	19.234	.113			.85

Marwitz - Anova - Memory Data only (Grps 1 & 2)

Anova table for a 2-factor repeated measures Anova.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value:
GROUP (A)	1	.027	.027	.359	.5531
subjects w. groups	34	2.526	.074		
Repeated Measure (B)	5	.393	.079	.694	.6287
AB	5	.147	.029	.259	.9346
B x subjects w. groups	170	19.234	.113		

There were no missing cells found.

Page 1 of the AB Incidence table

Repeated Mea...		MM1	MM2	MM4	MM6	MM8
GROUP	level 1	18 .289	18 .389	18 .4	18 .378	18 .444
	level 2	18 .322	18 .333	18 .411	18 .378	18 .444
Totals:		36 .306	36 .361	36 .406	36 .378	36 .444

Page 2 of the AB Incidence table

Repeated Mea...		MM10	Totals:
GROUP	level 1	18 .456	108 .393
	level 2	18 .333	108 .37
Totals:		36 .394	216 .381

2 X 6 Mixed Anova

Appendix D: Analysis of Variance of Rating Scores

(Faces 1-6 done from memory for Face-First and

Instructions-First Groups)

ANOVA Summary Table for Relax/Seagate0:•STUDENT FOLDERS:MARWITZ THESIS NEWER:MARW THESIS 6 FACE RATING

Source of Variation	df	Sum of Squares	Mean Square	F	p	Epsilon Correction
A	1	.074	.074	.061	.8062	
Error	34	41.210	1.212			
B	5	5.833	1.167	2.493	.0330	
AB	5	.888	.178	.380	.8622	
Error	170	79.533	.468			.86

Horwitz rAnova - Memory Data only - RATINGS (Grps 1 & 2)

Anova table for a 2-factor repeated measures Anova.

Source:	df:	Sum of Squares:	Mean Square:	F-test:	P value
GROUP (A)	1	.074	.074	.061	.8062
subjects w. groups	34	41.21	1.212		
Repeated Measure (B)	5	5.833	1.167	2.496	.033
AB	5	.888	.178	.38	.8622
B x subjects w. groups	170	79.533	.468		

There were no missing cells found.

Page 1 of the AB Incidence table

Repeated Mea...		RR1	RR2	RR4	RR6	RR8
GROUP	level 1	18 1.522	18 1.556	18 2	18 1.789	18 1.778
	level 2	18 1.533	18 1.578	18 1.678	18 1.789	18 1.8
Totals:		36 1.528	36 1.567	36 1.839	36 1.789	36 1.789

Page 2 of the AB Incidence table

Repeated Mea...		RR10	Totals:
GROUP	level 1	18 1.989	108 1.772
	level 2	18 2.033	108 1.735
Totals:		36 2.011	216 1.754

2 X 6 Mixed Anova RATINGS

Appendix E: Analysis of Variance of Matching Scores for Faces 2-6

(Memory and In-View for Face-First and Instructions-First Groups)

ANOVA Summary Table for Relax/Seagate0:•STUDENT FOLDERS:MARWITZ THESIS NEWER:MARW THESIS 10FAC MATCHING

Source of Variation	df	Sum of Squares	Mean Square	F	p	Epsilon Correction
A	1	.093	.093	.732	.3983	
Error	34	4.342	.128			
B	4	.097	.024	.144	.9656	
AB	4	.055	.014	.082	.9879	
Error	136	22.896	.168			.92
C	1	.187	.187	4.896	.0337	
AC	1	.000	.000	.003	.9573	
Error	34	1.297	.038			1.00
BC	4	.357	.089	1.928	.1093	
ABC	4	.362	.090	1.952	.1054	
Error	136	6.297	.046			.87

GROUP 1	2ND FACE	MEMORY		.3889
GROUP 1	2ND FACE	IN-VIEW		.5222
GROUP 1	3RD FACE	MEMORY		.4000
GROUP 1	3RD FACE	IN-VIEW		.4222
GROUP 1	4TH FACE	MEMORY		.3778
GROUP 1	4TH FACE	IN-VIEW		.4556
GROUP 1	5TH FACE	MEMORY		.4444
GROUP 1	5TH FACE	IN-VIEW		.4667
GROUP 1	6TH FACE	MEMORY		.4556
GROUP 1	6TH FACE	IN-VIEW		.4222
GROUP 2	2ND FACE	MEMORY		.3333
GROUP 2	2ND FACE	IN-VIEW		.4889
GROUP 2	3RD FACE	MEMORY		.4111
GROUP 2	3RD FACE	IN-VIEW		.4111
GROUP 2	4TH FACE	MEMORY		.3778
GROUP 2	4TH FACE	IN-VIEW		.3556
GROUP 2	5TH FACE	MEMORY		.4444
GROUP 2	5TH FACE	IN-VIEW		.3444
GROUP 2	6TH FACE	MEMORY		.3333
GROUP 2	6TH FACE	IN-VIEW		.5333

2ND FACE	MEMORY	.3611
2ND FACE	IN-VIEW	.5056
3RD FACE	MEMORY	.4056
3RD FACE	IN-VIEW	.4167
4TH FACE	MEMORY	.3778
4TH FACE	IN-VIEW	.4056
5TH FACE	MEMORY	.4444
5TH FACE	IN-VIEW	.4056
6TH FACE	MEMORY	.3944
6TH FACE	IN-VIEW	.4778

C 1	.3967
C 2	.4422

Appendix F: Analysis of Variance of Rating Scores for Faces 2-6

(Memory and In-View for Face-First and Instructions-First Groups)

ANOVA Summary Table for Relax/Seagate0:•STUDENT FOLDERS:MARWITZ THESIS NEWER:MARW THESIS 10FACE RATING

Source of Variation	df	Sum of Squares	Mean Square	F	p	Epsilon Correction
A	1	.205	.205	.084	.7737	
Error	34	83.137	2.445			
B	4	10.547	2.637	3.966	.0045	
AB	4	1.154	.289	.434	.7839	
Error	136	90.411	.665			.87
C	1	5.625	5.625	22.782	.0000	
AC	1	.000	.000	.000	.9832	
Error	34	8.395	.247			1.00
BC	4	1.297	.324	1.755	.1414	
ABC	4	.070	.018	.095	.9838	
Error	136	25.113	.185			.85

GROUP 1 2ND FACE MEMORY	1.5556
GROUP 1 2ND FACE IN-VIEW	1.7889
GROUP 1 3RD FACE MEMORY	2.0000
GROUP 1 3RD FACE IN-VIEW	1.9889
GROUP 1 4TH FACE MEMORY	1.7889
GROUP 1 4TH FACE IN-VIEW	2.0667
GROUP 1 5TH FACE MEMORY	1.7778
GROUP 1 5TH FACE IN-VIEW	2.1111
GROUP 1 6TH FACE MEMORY	1.9889
GROUP 1 6TH FACE IN-VIEW	2.4111
GROUP 2 2ND FACE MEMORY	1.5778
GROUP 2 2ND FACE IN-VIEW	1.8111
GROUP 2 3RD FACE MEMORY	1.6778
GROUP 2 3RD FACE IN-VIEW	1.7667
GROUP 2 4TH FACE MEMORY	1.7889
GROUP 2 4TH FACE IN-VIEW	2.0556
GROUP 2 5TH FACE MEMORY	1.8000
GROUP 2 5TH FACE IN-VIEW	2.0667
GROUP 2 6TH FACE MEMORY	2.0333
GROUP 2 6TH FACE IN-VIEW	2.4222

2ND FACE	1.6833
3RD FACE	1.8583
4TH FACE	1.9250
5TH FACE	1.9389
6TH FACE	2.2139

2ND FACE MEMORY	1.5667
2ND FACE IN-VIEW	1.8000
3RD FACE MEMORY	1.8389
3RD FACE IN-VIEW	1.8778
4TH FACE MEMORY	1.7889
4TH FACE IN-VIEW	2.0611
5TH FACE MEMORY	1.7889
5TH FACE IN-VIEW	2.0889
6TH FACE MEMORY	2.0111
6TH FACE IN-VIEW	2.4167

MEMORY	1.7989
IN-VIEW	2.0489

Appendix G: Matching scores versus Chance

T-TEST -- MATCHING WITH CHANCE (.1667)

One Sample t-Test X_1: MM1

DF:	Sample Mean:	Pop. Mean:	t Value:	Prob. (2-tail):
17	.289	.167	1.876	.0779

One Sample t-Test X_2: MM2

DF:	Sample Mean:	Pop. Mean:	t Value:	Prob. (2-tail):
17	.389	.167	3.037	.0074

One Sample t-Test X_3: MM3

DF:	Sample Mean:	Pop. Mean:	t Value:	Prob. (2-tail):
17	.522	.167	4.475	.0003

One Sample t-Test X_4: MM4

DF:	Sample Mean:	Pop. Mean:	t Value:	Prob. (2-tail):
17	.4	.167	2.83	.0116

One Sample t-Test X_5: MM5

DF:	Sample Mean:	Pop. Mean:	t Value:	Prob. (2-tail):
17	.422	.167	3.458	.003

GROUP 1 ONLY

T-TEST -- MATCHING WITH CHANCE (.1667)

One Sample t-Test X_6: MM6

DF:	Sample Mean:	Pop. Mean:	t Value:	Prob. (2-tail):
17	.378	.167	2.856	.0109

One Sample t-Test X_7: MM7

DF:	Sample Mean:	Pop. Mean:	t Value:	Prob. (2-tail):
17	.456	.167	4.12	.0007

One Sample t-Test X_8: MM8

DF:	Sample Mean:	Pop. Mean:	t Value:	Prob. (2-tail):
17	.444	.167	3.617	.0021

One Sample t-Test X_9: MM9

DF:	Sample Mean:	Pop. Mean:	t Value:	Prob. (2-tail):
17	.467	.167	4.256	.0005

One Sample t-Test X_{10}: MM10

DF:	Sample Mean:	Pop. Mean:	t Value:	Prob. (2-tail):
17	.456	.167	3.741	.0016

GROUP 1 ONLY

T-TEST -- MATCHING WITH CHANCE (.1667)

One Sample t-Test X_{11} : MM11

DF:	Sample Mean:	Pop. Mean:	t Value:	Prob. (2-tail):
17	.422	.167	3.378	.0036

Range Restrictions

	Column Name:	Restriction:
AND	GROUP	$1 \leq X < 2$

GROUP 1 ONLY

T-TEST -- MATCHING WITH CHANCE (.1667)

One Sample t-Test X_1: MM1

DF:	Sample Mean:	Pop. Mean:	t Value:	Prob. (2-tail):
17	.322	.167	2.044	.0567

One Sample t-Test X_2: MM2

DF:	Sample Mean:	Pop. Mean:	t Value:	Prob. (2-tail):
17	.333	.167	2.104	.0506

One Sample t-Test X_3: MM3

DF:	Sample Mean:	Pop. Mean:	t Value:	Prob. (2-tail):
17	.489	.167	5.107	.0001

One Sample t-Test X_4: MM4

DF:	Sample Mean:	Pop. Mean:	t Value:	Prob. (2-tail):
17	.411	.167	3.12	.0062

One Sample t-Test X_5: MM5

DF:	Sample Mean:	Pop. Mean:	t Value:	Prob. (2-tail):
17	.411	.167	3.426	.0032

GROUP 2 ONLY

T-TEST -- MATCHING WITH CHANCE (.1667)

One Sample t-Test X_6: MM6

DF:	Sample Mean:	Pop. Mean:	t Value:	Prob. (2-tail):
17	.378	.167	2.242	.0386

One Sample t-Test X_7: MM7

DF:	Sample Mean:	Pop. Mean:	t Value:	Prob. (2-tail):
17	.356	.167	2.267	.0368

One Sample t-Test X_8: MM8

DF:	Sample Mean:	Pop. Mean:	t Value:	Prob. (2-tail):
17	.444	.167	3.617	.0021

One Sample t-Test X_9: MM9

DF:	Sample Mean:	Pop. Mean:	t Value:	Prob. (2-tail):
17	.344	.167	2.47	.0244

One Sample t-Test X_{10}: MM10

DF:	Sample Mean:	Pop. Mean:	t Value:	Prob. (2-tail):
17	.333	.167	2.499	.023

GROUP 2 ONLY

T-TEST -- MATCHING WITH CHANCE (.1667)

One Sample t-Test X_{11} : MM11

DF:	Sample Mean:	Pop. Mean:	t Value:	Prob. (2-tail):
17	.533	.167	5.669	.0001

Range Restrictions

	Column Name:	Restriction:
AND	GROUP	1 < X ≤ 2

GROUP 2 ONLY

Appendix H: Correlations between Matching and Rating Scores

Marwitz Thesis Data

Simple Regression X_{13}: MnMem5-Match Y_{13}: MnMem5-Rating

DF:	R:	R-squared:	Adj. R-squared:	Std. Error:
35	.571	.326	.306	.396

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
REGRESSION	1	2.575	2.575	16.416
RESIDUAL	34	5.334	.157	p = .0003
TOTAL	35	7.909		

No Residual Statistics Computed

Note: 18 cases deleted with missing values.

Simple Regression X_{13}: MnMem5-Match Y_{13}: MnMem5-Rating

Beta Coefficient Table

Parameter:	Value:	Std. Err.:	Std. Value:	t-Value:	Probability:
INTERCEPT	.988				
SLOPE	2.045	.505	.571	4.052	.0003

Confidence Intervals Table

Parameter:	95% Lower:	95% Upper:	90% Lower:	90% Upper:
MEAN (X,Y)	1.665	1.933	1.687	1.911
SLOPE	1.019	3.071	1.192	2.899

CORRELATIONS between QUALITY SCORES

Marwitz Thesis Data

Simple Regression X_{14}: MnView5-Match Y_{14}: MnView5-Rating

DF:	R:	R-squared:	Adj. R-squared:	Std. Error:
35	.618	.382	.364	.436

Analysis of Variance Table

Source	DF:	Sum Squares:	Mean Square:	F-test:
REGRESSION	1	3.988	3.988	21.022
RESIDUAL	34	6.45	.19	p = .0001
TOTAL	35	10.439		

No Residual Statistics Computed

Note: 18 cases deleted with missing values.

Simple Regression X_{14}: MnView5-Match Y_{14}: MnView5-Rating

Beta Coefficient Table

Parameter:	Value:	Std. Err.:	Std. Value:	t-Value:	Probability:
INTERCEPT	.837				
SLOPE	2.741	.598	.618	4.585	.0001

Confidence Intervals Table

Parameter:	95% Lower:	95% Upper:	90% Lower:	90% Upper:
MEAN (X,Y)	1.901	2.196	1.926	2.172
SLOPE	1.526	3.955	1.73	3.751

CORRELATIONS between QUALITY SCORES

Appendix I: Analysis of Recognition Scores

Marwitz Thesis Data

One Factor ANOVA X_1 : GROUP Y_1 : TARGET (HIT-MISS)

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	3.37	1.685	.556
Within groups	51	154.556	3.031	p = .5769
Total	53	157.926		

Model II estimate of between component variance = -.673

One Factor ANOVA X_1 : GROUP Y_1 : TARGET (HIT-MISS)

Group:	Count:	Mean:	Std. Dev.:	Std. Error:
Group 1	18	5.167	1.505	.355
Group 2	18	4.611	2.033	.479
Group 3	18	5.111	1.641	.387

One Factor ANOVA X_1 : GROUP Y_1 : TARGET (HIT-MISS)

Comparison:	Mean Diff.:	Fisher PLSD:	Scheffe F-test:	Dunnett t:
Group 1 vs. 2	.556	1.165	.458	.957
Group 1 vs. 3	.056	1.165	.005	.096
Group 2 vs. 3	-.5	1.165	.371	.862

RECOGNITION ANALYSES

Marwitz Thesis Data

One Factor ANOVA X_1: GROUP Y_2: MN FALSE ALARM (FACR)

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	.156	.078	.6
Within groups	51	6.631	.13	p = .5525
Total	53	6.787		

Model II estimate of between component variance = -.026

One Factor ANOVA X_1: GROUP Y_2: MN FALSE ALARM (FACR)

Group:	Count:	Mean:	Std. Dev.:	Std. Error:
Group 1	18	1.274	.384	.09
Group 2	18	1.346	.388	.091
Group 3	18	1.214	.304	.072

One Factor ANOVA X_1: GROUP Y_2: MN FALSE ALARM (FACR)

Comparison:	Mean Diff.:	Fisher PLSD:	Scheffe F-test:	Dunnett t:
Group 1 vs. 2	-.072	.241	.178	.597
Group 1 vs. 3	.06	.241	.124	.497
Group 2 vs. 3	.132	.241	.599	1.094

RECOGNITION ANALYSES

Marwitz Thesis Data

One Factor ANOVA X_1 : GROUP Y_3: HM/FACR DIFF

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	4.754	2.377	.716
Within groups	51	169.378	3.321	p = .4937
Total	53	174.132		

Model II estimate of between component variance = -.472

One Factor ANOVA X_1 : GROUP Y_3: HM/FACR DIFF

Group:	Count:	Mean:	Std. Dev.:	Std. Error:
Group 1	18	3.892	1.519	.358
Group 2	18	3.265	2.136	.504
Group 3	18	3.897	1.759	.415

One Factor ANOVA X_1 : GROUP Y_3: HM/FACR DIFF

Comparison:	Mean Diff.:	Fisher PLSD:	Scheffe F-test:	Dunnett t:
Group 1 vs. 2	.627	1.22	.533	1.033
Group 1 vs. 3	-.004	1.22	2.411E-5	.007
Group 2 vs. 3	-.632	1.22	.54	1.04

RECOGNITION ANALYSES

Merwitz Thesis Data

One Factor ANOVA X_1 : GROUP Y_4 : PROPORTION HIT

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	.259	.13	.838
Within groups	51	7.889	.155	p = .4384
Total	53	8.148		

Model II estimate of between component variance = -.013

One Factor ANOVA X_1 : GROUP Y_4 : PROPORTION HIT

Group:	Count:	Mean:	Std. Dev.:	Std. Error:
Group 1	18	.833	.383	.09
Group 2	18	.722	.461	.109
Group 3	18	.889	.323	.076

One Factor ANOVA X_1 : GROUP Y_4 : PROPORTION HIT

Comparison:	Mean Diff.:	Fisher PLSD:	Scheffe F-test:	Dunnett t:
Group 1 vs. 2	.111	.263	.359	.848
Group 1 vs. 3	-.056	.263	.09	.424
Group 2 vs. 3	-.167	.263	.808	1.271

RECOGNITION ANALYSES

Marwitz Thesis Data

One Factor ANOVA X_1 : GROUP Y_5 : PROP FALSE ALARM (PFA)

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	.004	.002	.712
Within groups	51	.137	.003	p = .4953
Total	53	.14		

Model II estimate of between component variance = -3.852E-4

One Factor ANOVA X_1 : GROUP Y_5 : PROP FALSE ALARM (PFA)

Group:	Count:	Mean:	Std. Dev.:	Std. Error:
Group 1	18	.028	.045	.011
Group 2	18	.041	.066	.016
Group 3	18	.02	.041	.01

One Factor ANOVA X_1 : GROUP Y_5 : PROP FALSE ALARM (PFA)

Comparison:	Mean Diff.:	Fisher PLSD:	Scheffe F-test:	Dunnett t:
Group 1 vs. 2	-.013	.035	.269	.734
Group 1 vs. 3	.008	.035	.101	.448
Group 2 vs. 3	.02	.035	.699	1.182

RECOGNITION ANALYSES

Merwitz Thesis Data

One Factor ANOVA X_1 : GROUP Y_6 : STANDARDIZED HIT-MISS (SHM)

Analysis of Variance Table

Source:	DF:	Sum Squares:	Mean Square:	F-test:
Between groups	2	34.137	17.069	1.78
Within groups	51	488.987	9.588	p = .1789
Total	53	523.124		

Model II estimate of between component variance = 3.74

One Factor ANOVA X_1 : GROUP Y_6 : STANDARDIZED HIT-MISS (SHM)

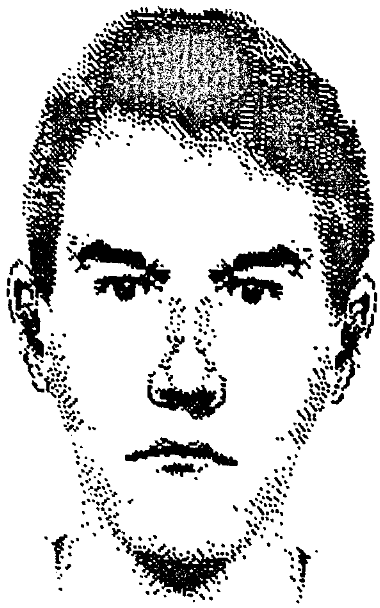
Group:	Count:	Mean:	Std. Dev.:	Std. Error:
Group 1	18	5.881	2.616	.616
Group 2	18	4.409	3.349	.789
Group 3	18	6.249	3.272	.771

One Factor ANOVA X_1 : GROUP Y_6 : STANDARDIZED HIT-MISS (SHM)

Comparison:	Mean Diff.:	Fisher PLSD:	Scheffe F-test:	Dunnett t:
Group 1 vs. 2	1.472	2.072	1.017	1.426
Group 1 vs. 3	-.368	2.072	.064	.357
Group 2 vs. 3	-1.84	2.072	1.59	1.783

RECOGNITION ANALYSES

Appendix J: Sample Composite Faces



Appendix K: Sample Features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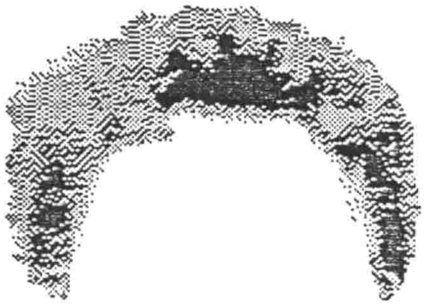
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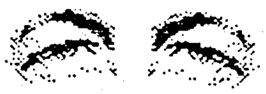

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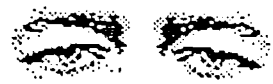

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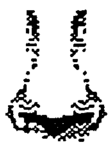
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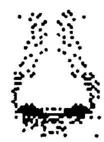
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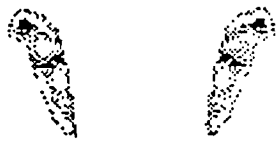

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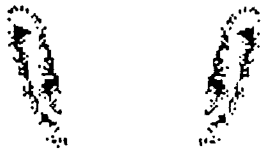

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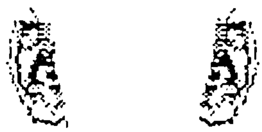

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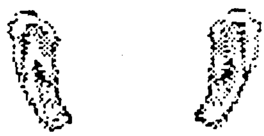

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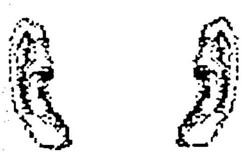

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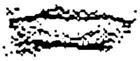
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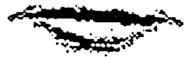
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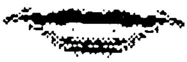
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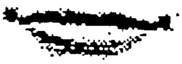
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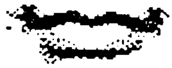
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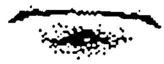
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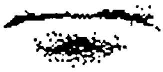
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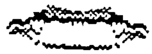
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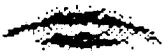
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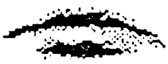
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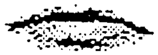
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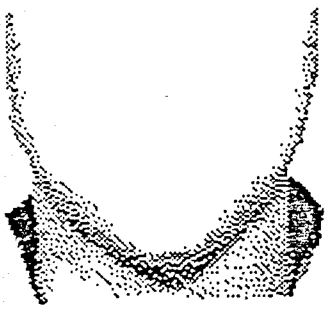

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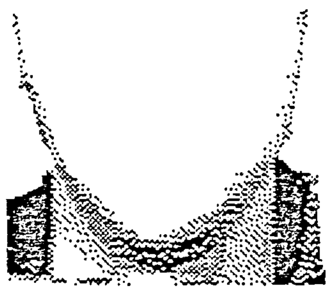

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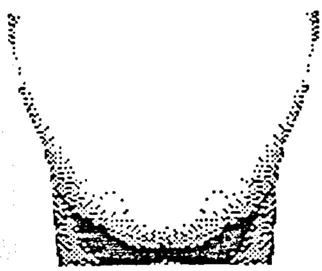
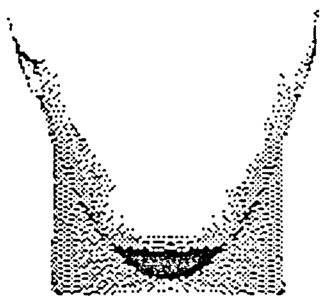


16.



17.

Appendix L: Samples of Forms Used in the Study

Consent Form

To the prospective subject:

We are conducting research on the generation of composite likenesses.

Your task is to construct several composites following the instructions given to you by the experimenter. Your results will be used in a later portion of this experiment; however, your anonymity is guaranteed.

There is no risk involved, nevertheless, you are free to withdraw without penalty.

PARTICIPANT'S CONSENT:

I have read the above statement and understand the conditions under which I agree to participate in this study.

Signed,
(signature)

____

Print name below.

____

Social Security Number.

____

Name____________________

Instructions

Matching Phase

Judges: You are to view each of the composite faces in the booklets and indicate which of the master faces it most resembles. That is, for each composite, choose the master face upon which the composite was based and place this number in the space beside the corresponding composite face number.

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143______
144______
145______

146. ______	184. ______	222. ______	260. ______
147. ______	185. ______	223. ______	261. ______
148. ______	186. ______	224. ______	262. ______
149. ______	187. ______	225. ______	263. ______
150. ______	188. ______	226. ______	264. ______
151. ______	189. ______	227. ______	265. ______
152. ______	190. ______	228. ______	266. ______
153. ______	191. ______	229. ______	267. ______
154. ______	192. ______	230. ______	268. ______
155. ______	193. ______	231. ______	269. ______
156. ______	194. ______	232. ______	270. ______
157. ______	195. ______	233. ______	271. ______
158. ______	196. ______	234. ______	272. ______
159. ______	197. ______	235. ______	273. ______
160. ______	198. ______	236. ______	274. ______
161. ______	199. ______	237. ______	275. ______
162. ______	200. ______	238. ______	276. ______
163. ______	201. ______	239. ______	277. ______
164. ______	202. ______	240. ______	278. ______
165. ______	203. ______	241. ______	279. ______
166. ______	204. ______	242. ______	280. ______
167. ______	205. ______	243. ______	281. ______
168. ______	206. ______	244. ______	282. ______
169. ______	207. ______	245. ______	283. ______
170. ______	208. ______	246. ______	284. ______
171. ______	209. ______	247. ______	285. ______
172. ______	210. ______	248. ______	286. ______
173. ______	211. ______	249. ______	287. ______
174. ______	212. ______	250. ______	288. ______
175. ______	213. ______	251. ______	289. ______
176. ______	214. ______	252. ______	290. ______
177. ______	215. ______	253. ______	291. ______
178. ______	216. ______	254. ______	292. ______
179. ______	217. ______	255. ______	293. ______
180. ______	218. ______	256. ______	294. ______
181. ______	219. ______	257. ______	295. ______
182. ______	220. ______	258. ______	296. ______
183. ______	221. ______	259. ______	297. ______

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409.______
410.______
411.______
412.______
413.______
414.______

NAME____________________

Instructions

Rating Phase

Judges. You will be given a booklet of composites and the master face from which each of these composites was generated. Your task is to compare each composite with its respective master face and rate the composite on its similarity to the master face. Please rate each composite using the scale below:

```
|------------|------------|------------|------------|------------|
0            1            2            3            4            5
Not                                                       Extremely
Similar                                                     Similar
At all
```

Face 1

1.______	26.______	51.______
2.______	27.______	52.______
3.______	28.______	53.______
4.______	29.______	54.______
5.______	30.______	55.______
6.______	31.______	56.______
7.______	32.______	57.______
8.______	33.______	58.______
9.______	34.______	59.______
10.______	35.______	60.______
11.______	36.______	61.______
12.______	37.______	62.______
13.______	38.______	63.______
14.______	39.______	64.______
15.______	40.______	65.______
16.______	41.______	66.______
17.______	42.______	67.______
18.______	43.______	68.______
19.______	44.______	69.______
20.______	45.______	
21.______	46.______	
22.______	47.______	
23.______	48.______	
24.______	49.______	
25.______	50.______	

Face 2

1.______
2.______
3.______
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5.______

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7.______
8.______
9.______
10.______

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12.______
13.______
14.______
15.______

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18.______
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66.______
67.______
68.______
69.______

Face 3

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Face 4

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67.______
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69.______

Face 5

1.______	26.______	51.______
2.______	27.______	52.______
3.______	28.______	53.______
4.______	29.______	54.______
5.______	30.______	55.______
6.______	31.______	56.______
7.______	32.______	57.______
8.______	33.______	58.______
9.______	34.______	59.______
10.______	35.______	60.______
11.______	36.______	61.______
12.______	37.______	62.______
13.______	38.______	63.______
14.______	39.______	64.______
15.______	40.______	65.______
16.______	41.______	66.______
17.______	42.______	67.______
18.______	43.______	68.______
19.______	44.______	69.______
20.______	45.______	
21.______	46.______	
22.______	47.______	
23.______	48.______	
24.______	49.______	
25.______	50.______	

Face 6

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69._____

NAME____________________ GROUP______ FACE______

INSTRUCTIONS: For each of the slides that you will be shown please indicate whether you remember seeing that person earlier as the target face. Please rate your answer along the following scale.

NO RESPONSES			YES RESPONSES		
1	2	3	4	5	6
certainly not presented	probably not presented	guessed not presented	guessed presented before	probably presented before	certainly presented before

1.___	16.___	31.___	46.___	61.___	76.___
2.___	17.___	32.___	47.___	62.___	77.___
3.___	18.___	33.___	48.___	63.___	78.___
4.___	19.___	34.___	49.___	64.___	79.___
5.___	20.___	35.___	50.___	65.___	80.___
6.___	21.___	36.___	51.___	66.___	
7.___	22.___	37.___	52.___	67.___	
8.___	23.___	38.___	53.___	68.___	
9.___	24.___	39.___	54.___	69.___	
10.___	25.___	40.___	55.___	70.___	
11.___	26.___	41.___	56.___	71.___	
12.___	27.___	42.___	57.___	72.___	
13.___	28.___	43.___	58.___	73.___	
14.___	29.___	44.___	59.___	74.___	
15.___	30.___	45.___	60.___	75.___	

Biography

David Bradley Marwitz was born September 20, 1964 in Palatka, Florida. He received his B. A. in psychology from the University of Virginia in 1986. Brad is currently working on his doctorate in human factors psychology at Rice University in Houston, Texas.